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SEPTEMBER 2015

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Use an industrial idea to create a kinetic chain *p. 30*

Volume 11 • Issue 6

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Check out a collection of handy charts for measurements and conversions.

See an online gallery of work by Tom Muir, his students, and colleagues.

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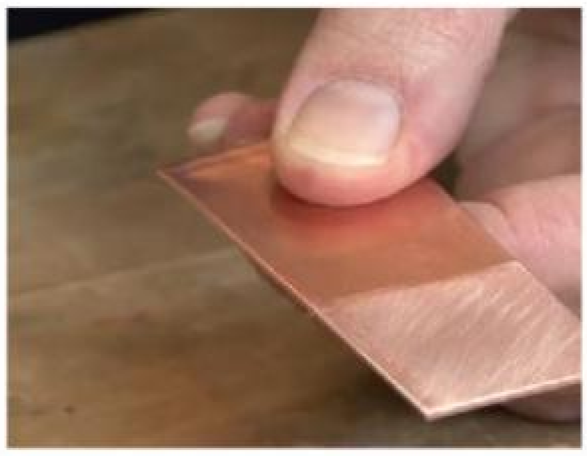

» Learn a variety of no-impact methods for giving your metal a textured finish.

» Learn the basics of creating felt for use in textile-based jewelry.

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TOOLS | **ALL LEVELS**

Make Your Own Fume-safe Trivet

When you're applying a fumed patina, metal trivets can corrode. Use a simple template to repurpose plastic and make your own non-flaking trivets!

by Gisela Kati Andara

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All the ways that jewelry moves

Some forms of modern art have embraced the concept that experiencing and observing a work of art is as much about the canvas as it is about the work itself. Because jewelry's "canvas" is the human body, it takes that concept a step further. For jewelry that is designed to be wearable, the way that it appears upon — and interacts with — the human body is key to its appeal. As the human body is not a static canvas, but is instead constantly in motion (whether sustained or sudden), a jewel moves as well. Even rigid jewelry moves simply by virtue of being worn.

Jon Ryan

Some designers go beyond the stationary and create mechanisms through which components of jewelry pieces move in relation to each other. Elements twist and turn, or hinges allow parts to open and close. Jewelry is no longer rigid; it has flexibility and the potential to expand and contract. And some makers take the idea of movable jewelry even further, adding elements that, while still contained within a piece, move independently. Beads suspended in carefully wrought cages, elements that swing on a central post, and miniature "toys" that invite the wearer to play all employ kinetics as an aesthetic choice. Even as simple a design as a pair of dangling, swinging earrings expresses the appeal of kinetics — it transforms a static piece into an interactive one, and promotes the wearer from simple canvas to playmate and performer.

> The way [jewelry] appears upon — and interacts with — the human body is key to its appeal.

In this issue, we're exploring the different ways that jewelry can move — from links in a chain that are joined on an axle, to hidden hinges, to rings that spin as the hand moves (this is especially fun for those of us who talk with our hands!), to a gallery of work by international artists who are exploring motion in their work. If the jewelry field doesn't stand still, why should the jewelry itself?

Hazel Wheaton

hwheaton@artjewelrymag.com

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112.608

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Franklin, NC....................May 8-9-10
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Franklin, NC...........July 23-24-25-26
Spruce Pine, NC......July 30-31-Aug. 1-2
Tucson, AZ....September 10-11-12-13
Minneapolis, MN....September 27-28
Livonia (Detroit), MI.....October 2-3-4
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CALLS FOR ENTRIES

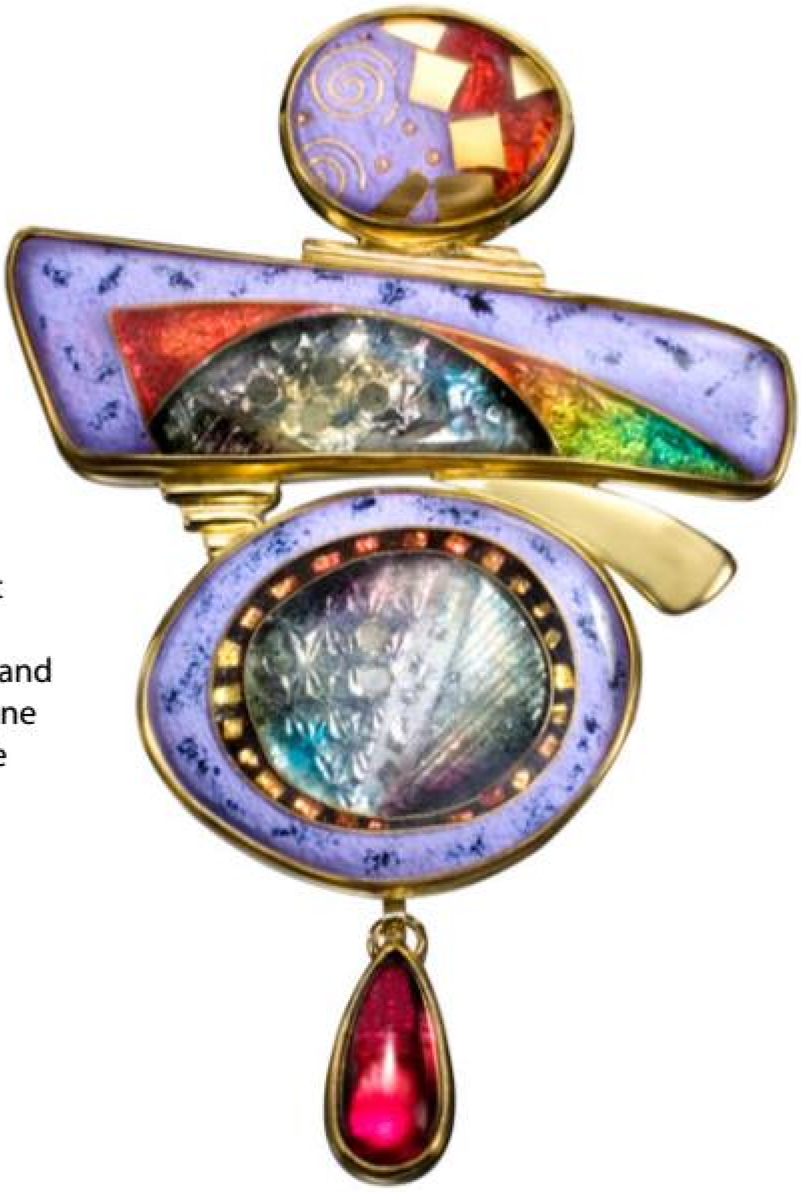
WORKSHOP

Modern Masters at Wildacres

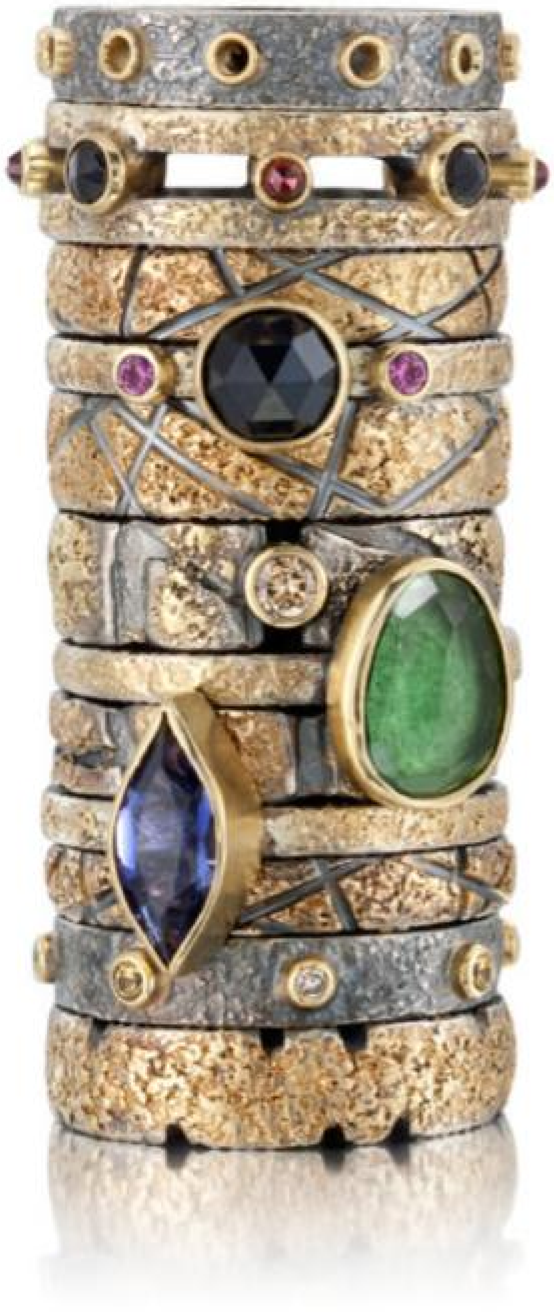
What: Modern Masters is a biannual, five-day workshop at Wildacres Retreat in the Great Smoky Mountains of North Carolina. Classes are taught by some of the most talented and respected instructors in the industry (this year, including one of *Art Jewelry*'s department authors, Chris Darway). Choose from the following classes:

- Jenny Reeves: "Learn Torch Control and Fusing of Hollow Forms" (waitlist only)
- Chris Darway: "Paint the Town Gold"
- Ricky Frank: "Enameling Made Easy"
- Kirk Lang: "Animated Adornment: An Introduction to Kinetic Jewelry Design"

When: October 5–11, 2015
Where: Little Switzerland, N.C.
For more information: www.fsg4u.com

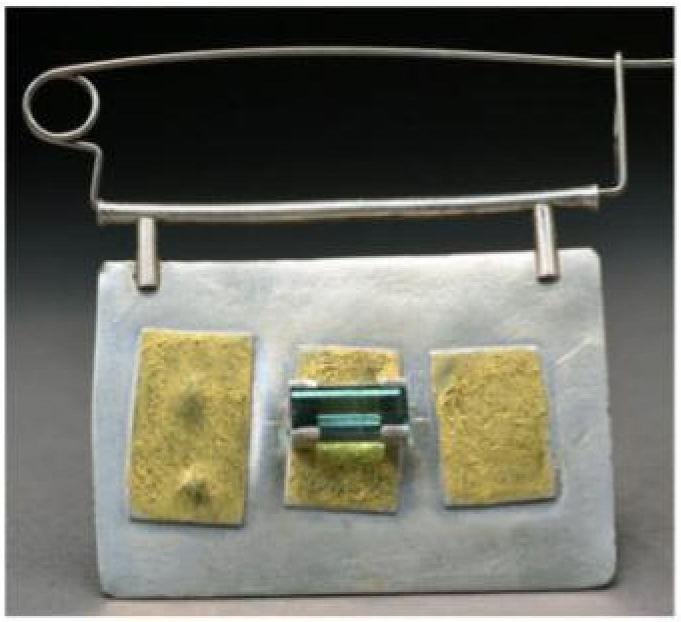


▲ **Ricky Frank's *Purple Stacked Figure* pin/pendant features 24k-gold cloisonné (with handmade fine-silver foil) set in 22k and 18k gold and sterling silver, and highlights a pink tourmaline.** Photo by Ralph Gabriner.

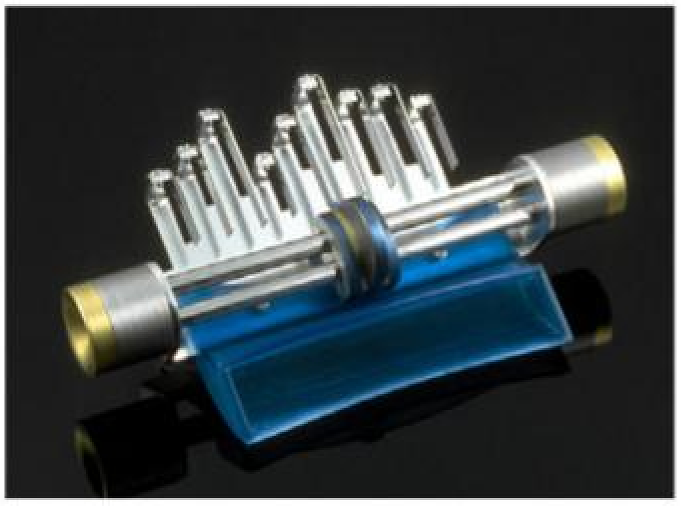


◄ **Jenny Reeves' *Ring Stack* combines Argentium sterling silver, 18k gold, black spinel, garnet, tourmaline, iolite, yellow sapphire, and diamonds.**

Photo by Hap Sakwa.



► **Chris Darway's fibula-style brooch is made of fused sterling silver, Aura 22, stainless steel, and green tourmaline. 2 x 1½ in. (51 x 38 mm).** Photo by Chet Bolins.



► ***Sound Study #2* by Kirk Lang is a noisemaker that doubles as a brooch. The sliding titanium tab plucks the stainless-steel tines, generating a variety of musical sounds. Sterling silver, stainless steel, titanium, brass, and resin. 3.25 x 6 x 2 cm (approximately $1\tfrac{5}{16}$ x $2\tfrac{3}{8}$ x $\tfrac{25}{32}$ in.)** Photo by the artist.

READER FORUM

Tumbler source

I watched your YouTube video on tumbling jewelry that was published a few years ago. There was a post asking for the brand of tumbler, but I did not see the response. I have researched several brands and everyone has their likes and dislikes, pros and cons. The tumbler shown seems perfect for what I am looking for. It looks small, quiet, and easy to set up. May I please know the brand name and the size of the tumbler featured?

— Lesa Jensen
via www.artjewelrymag.com

Editor Hazel Wheaton responds:
Thanks so much for your email, and your question. The tumbler we use in our studio is a mini rotary tumbler that we bought from Gesswein (www.gesswein.com/p-1297-mini-rotary-tumblers.aspx), with a 3-lb. capacity barrel. Most of the major jewelry suppliers have comparable models — for example, Otto Frei has one (www.ottofrei.com/Small-Rotary-Tumbler.html) that's almost exactly the same as ours (and is probably made by the same manufacturer), but runs on a different voltage (110 vs. 115). I hope this helps!

Letter of appreciation

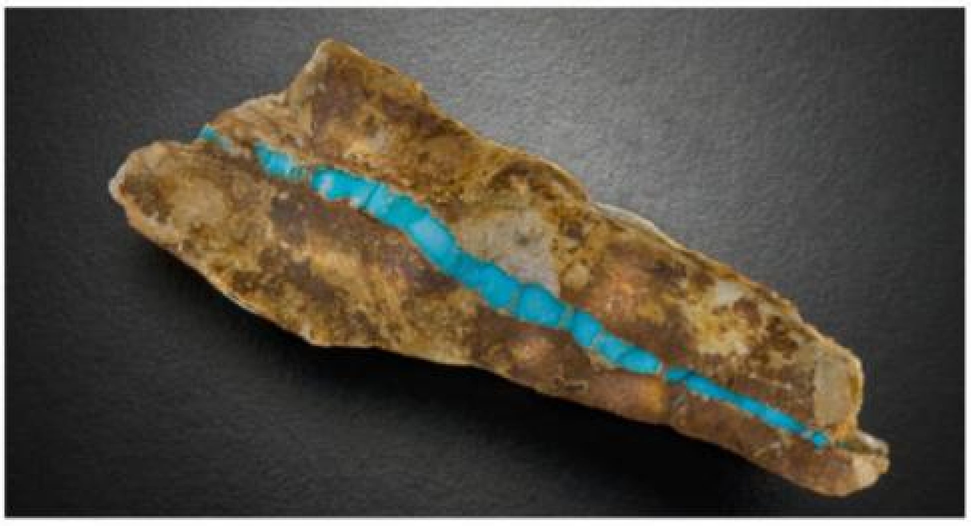
I just started a subscription to your magazine a few weeks ago and have already purchased a half-dozen back issues. This art jewelry venue is new to me as I'm expanding my studio and changing directions, and I just can't get enough of your magazine! Each issue I bought had tons of info in it I wasn't even counting on, as I bought based on the covers. Your magazine is a gold mine of information! I'll keep buying back issues. They're fantastic! Many magazines can't keep going

continued on page 12

EXHIBITION

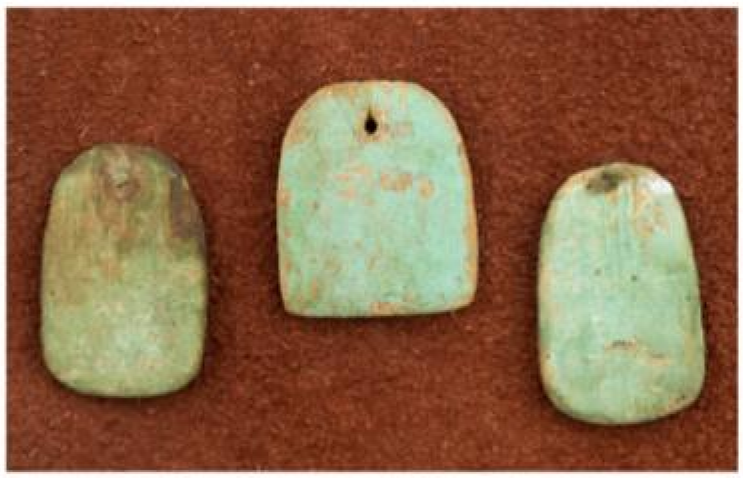
Turquoise, Water, Sky:
The Stone and its Meaning

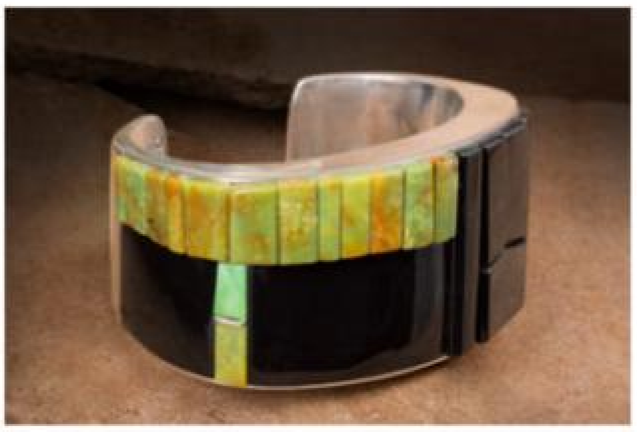
What: What causes different colors of turquoise? What makes it valuable? Over 500 objects on view highlight the Museum of Indian Arts and Culture's extensive collection of Southwestern turquoise jewelry. Not only will you see necklaces, bracelets, and other decorative objects, but you'll also discover the importance of turquoise (not necessarily only the stone, but the color itself) to Southwestern cultures. Learn about the stone's geology, mining, and history, and see why turquoise is symbolic of this region.
When: Through March 2, 2016
Where: Museum of Indian Arts and Culture, Santa Fe, N.M.
For more information: www.indianartsandculture.org



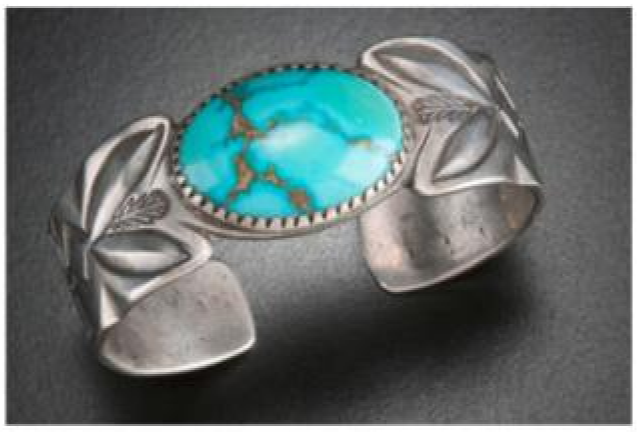
◀ **Turquoise rough from the Cerrillos mining district.** Photo by Blair Clark.

▶ **Turquoise's appeal comes from its color, not just the stone itself. Even 800 years ago, these faux-turquoise pendants probably never fooled anyone, nor were they meant to. These malachite-painted wooden pendants were used just like the real stone.** Photo by Kitty Leaken.



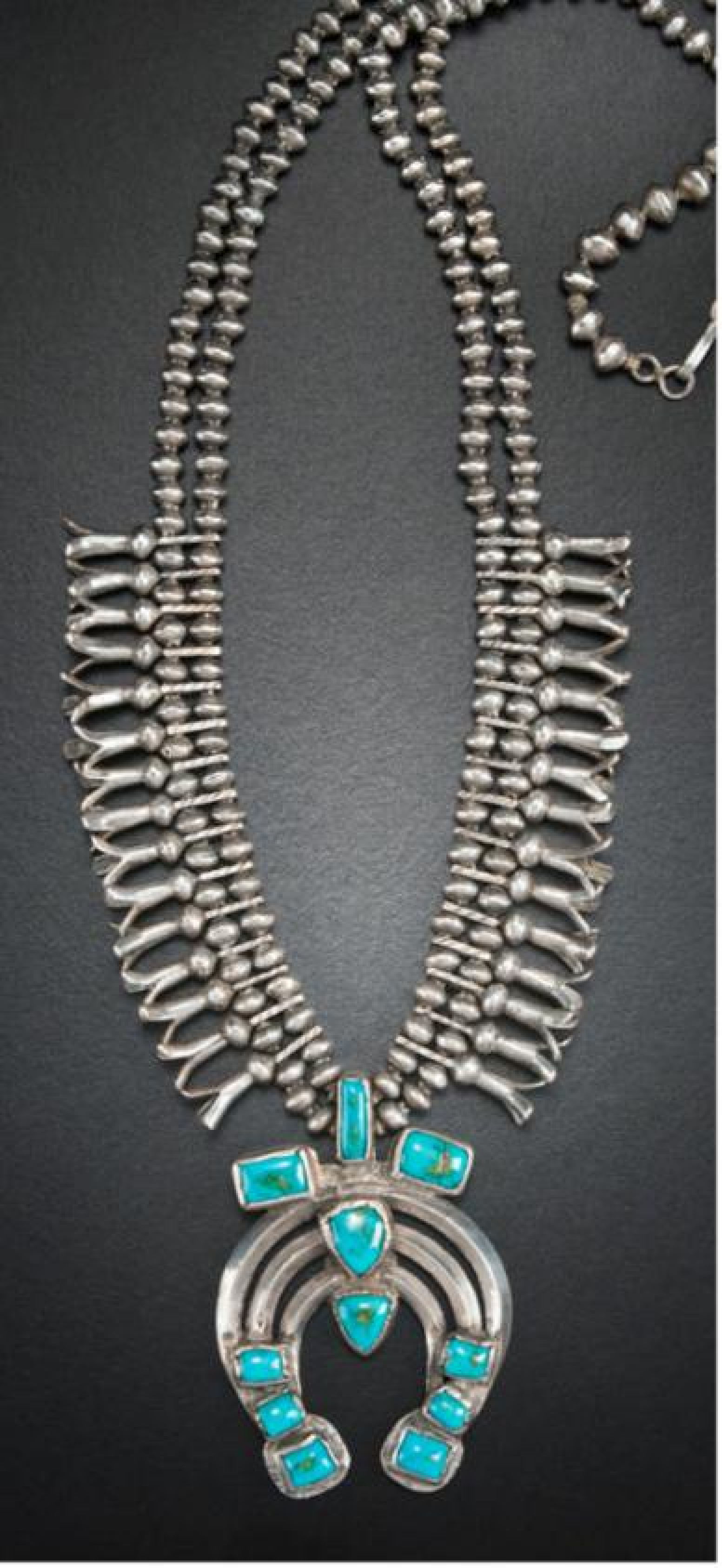


▲ **NaNa Ping (Pasqua Yaqui) used black jade and Kingman turquoise to create this striking contemporary bracelet using the time-honored technique of inlaying stone into silver.** Photo by Kitty Leaken.

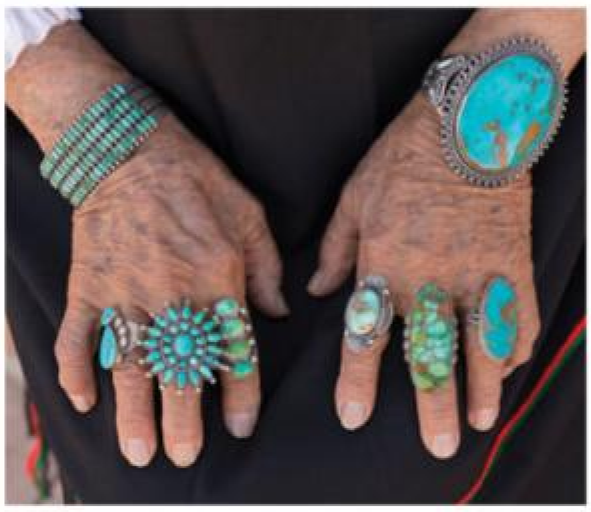


▲ **This silver Navajo bracelet (1920–30) turns the spotlight on a Fox Mine turquoise cabochon.** Photo by Blair Clark.

All images courtesy of the Museum of Indian Arts and Culture/Laboratory of Anthropology.



▲ **This silver and Blue Gem turquoise squash-blossom necklace (1920–30) is a common Navajo motif.** Photo by Blair Clark.



▲ **These bracelets and rings with large, single cabochons and clusters of small, yet precisely cut stones date from the 1910s to the present and show turquoise at its best.** Photo by Kitty Leaken.

Book review

Art Jewelry Today: Europe

By Catherine Mallette
Schiffer Publishing, 2014
$50.00
ISBN: 978-0-7643-4678-1

Art Jewelry Today
EUROPE
Catherine Mallette

The first in Schiffer Publishing's *Art Jewelry Today* series to focus on European art/studio jewelers, *Art Jewelry Today: Europe* gives readers a glimpse into the studio practices of 61 contemporary art jewelers and insight into the inspirations behind their creations. Included alongside a body of work from each artist is their artist statement, an explanation/exploration of their jewelry, or extra tidbits of information that help the reader experience the work more fully. Whether the works shown are from a known body of work or a seldom-seen collection, the photographs (each is given ample room on the page to allow it to breathe) will draw you in. Maybe you're familiar with some of these artists, maybe not. Either way, you'll want to keep turning the pages to discover the breadth of materials being used and to explore the conceptual bases for each piece. I know I did.
—*Annie Pennington*

coming in the November 2015 issue

START-UP SPOTLIGHT

GREAT PROJECTS FOR BEGINNERS IN METAL, METAL CLAY, AND POLYMER!

READER FORUM

continued from page 10

these days. Costs of printing are incredible. I know. I was in publishing over a decade ago and they were incredible then. I can see why you have been going as long as you have, and I can't see any reason for sales to ever slow. You have a premium product. Keep it up!

— Stephanie Michaud
via www.artjewelrymag.com

Duckbill pliers

Thank you for the professional and artist-correct articles in *Art Jewelry* magazine. My subscription has been a 6–8-year affair, many thanks. You have a great staff, because the current *Art Jewelry* magazine is so professionally presented. In "Capture the Glass Ring within Two Classic Weaves" (January 2015 issue), the "Tool Spotlight" shows a pair of duckbill pliers. I cannot find this tool. Can you please send me the vendor's email address to place an order with them?

—Joe Dennard
via email

Assistant Editor Theresa D. Abelew responds: *I'm glad you are enjoying our magazine! I looked into your question about vendors for the duckbill pliers and I have two reputable vendors to check out. The author of the project, Catherine Randolph Hamilton, ordered her jump rings from Blue Buddha Boutique (www.bluebuddhaboutique.com); they also sell the pliers. As for the actual pliers shown in the "Tool Spotlight," that pair is from a local-to-us company, Cool Tools (www.cooltools.us). You'll have to let us know what you think of the duckbill pliers and show us what you make with them!*

tell us what you think!

Send your questions, comments, and tips via email to ***editor@artjewelrymag.com****. Letters may be edited for clarity and length.*

EXHIBITION

Haystack Components:

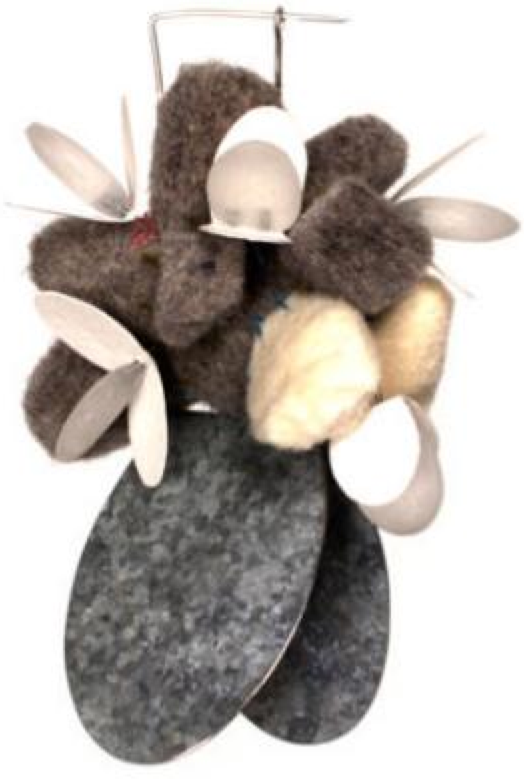
Metals and Jewelry

What: Take a trip to the Fuller Craft Museum to visit this showcase of the work of teachers, teaching assistants, students, staff, and board members who are connected to Haystack Mountain School of Crafts. With jewelry and other wearable objects ranging from CAD designed to meticulously handcrafted, the work on display is as varied as Haystack's programming. The artists in this exhibition are connected by a love of the school and the transformative effect Haystack has had on them. Their artworks — their components — are part of an intangible community that stretches boundaries and preserves tradition.

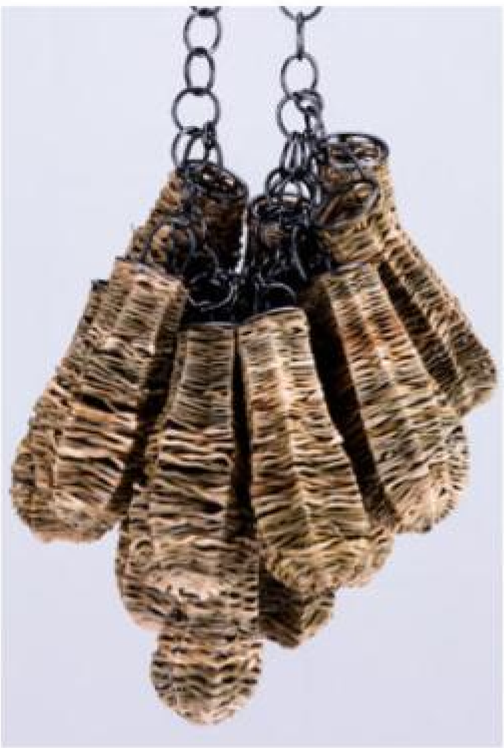
When: Through November 1, 2015

Where: Fuller Craft Museum, Brockton, Mass.

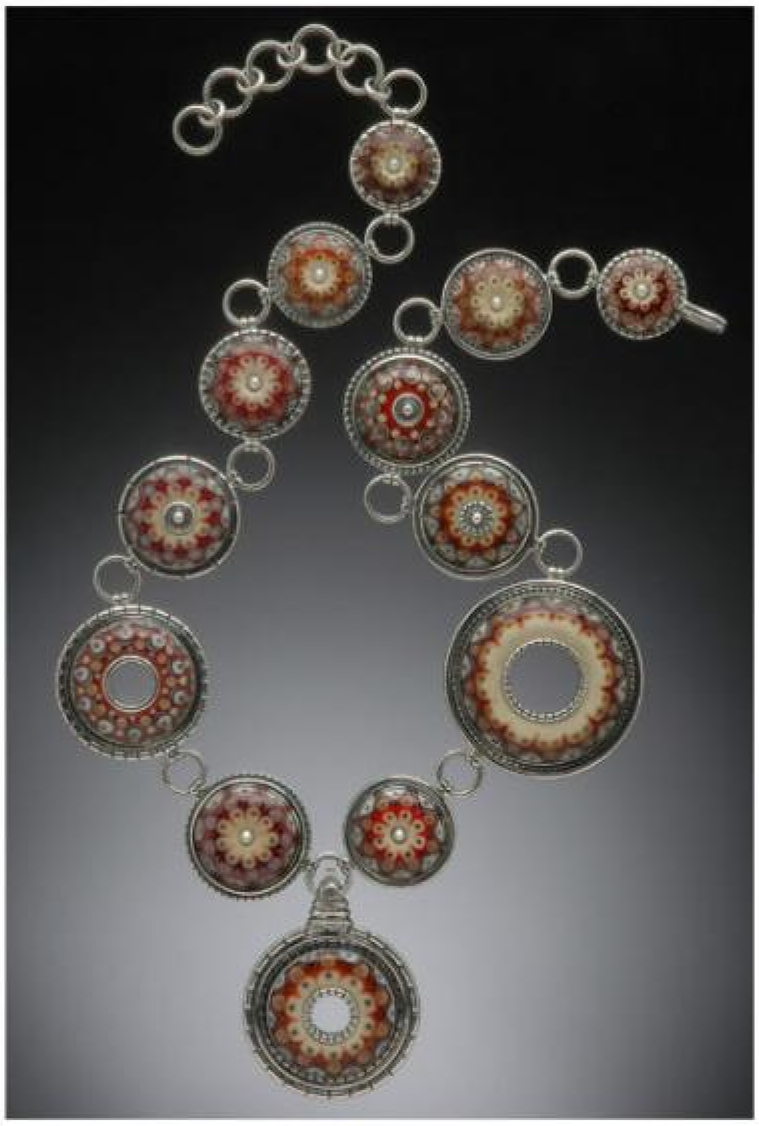
For more information: www.fullercraft.org



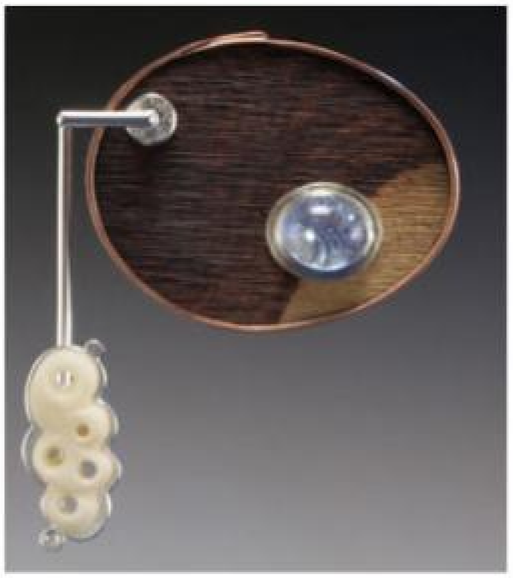
▲ See mixed-material work, like this brooch by Nicole Jacquard titled *Corsage Brooch*. It's made of galvanized steel, felt, silver, paper, acrylic, embroidery thread, and carved felt. 11 x 5 x 5 cm (approximately 5½ x 2 x 2 in.).



▲ Tanya Crane's *Canopica* necklace combines silver, NuGold, and woven sea grass. 20 x 8 x 2 in. (50.8 x 20.3 x 5.1 cm). Photo by Jim Escalante.



▲ Also on exhibit is *Red Floral Constellation*, a necklace with pendant by Kristina Logan. Flameworked glass, sterling silver. 24 x 2 in. (61 x 5.1 cm).



◀ Kristin Mitsu Shiga's *Follicle* brooch is made of copper, sterling silver, quartz, palm nut, and cocobolo.

SPOTLIGHT READER TIP #1

Blow it away

I keep a can of compressed air on my workbench — it has many uses. Before I stamp metal for etching, I use the air-in-a-can to dry any remaining rubbing alcohol and blow away dust. Also, when polishing with my flex shaft, metal pieces tend to get hot. Using the air-in-a-can to cool the pieces is much faster than quenching and drying. I also use it to blow away sanding or filing dust from the pieces I am working on (especially crevices, hard-to-reach places, and inside bezels) or my work area.

—*Kristen Kuzma, Garfield Heights, Ohio*

We're looking for your best studio tips and tricks! We've made it easy to submit your ideas — go to www.artjewelrymag.com/TipsFromOurReaders and share your tips with us. We'll choose a new spotlight reader tip for each issue; If your tip is chosen, you'll receive a $100 gift certificate courtesy of our Tip sponsor, Contenti (www.contenti.com)!

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CALL FOR ENTRIES

Fiesta Arts Fair

What: Now in its 43rd year, Fiesta Arts Fair is an intimate, two-day event that offers art lovers an opportunity to purchase high-quality contemporary and traditional art and craft from approximately 115 exhibitors. The fair also includes two stages of live, regional music, food, and a children's art area, all in a beautiful setting — the picturesque and historic grounds of the Southwest School of Art, located along San Antonio's famed River Walk. Juror-selected cash awards and artists' amenities are also provided.

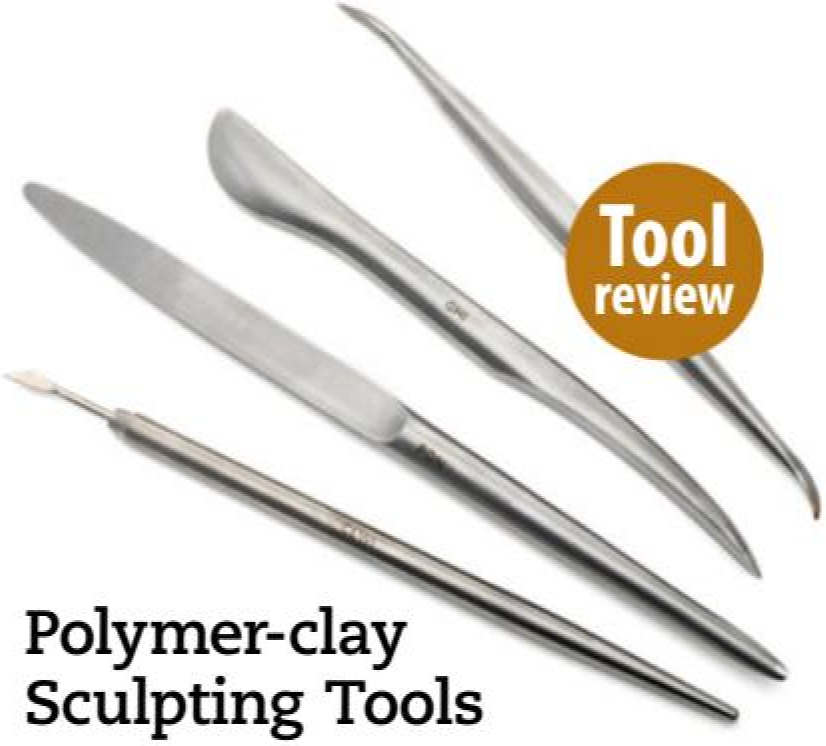
Where: San Antonio, Texas

When: Applications due by November 1, 2015; Fair, April 18–19, 2016

For more information: www.swschool.org/fiestaartsfair

Photo courtesy of Southwest School of Art.

Tool review



Polymer-clay Sculpting Tools

You know the feeling when you pick up a tool and immediately go "Oooh!" because it feels so good in your hand? Yeah, that's what happened when I picked up Christi Friesen's new tool set. Her new stainless-steel tools are sturdy, and they're great for sculpting, texturing, poking, and otherwise manipulating polymer. While they are designed by a polymer clay artist, they'd work great for shaping other types of clay … and wax!

Each of the four styles is well balanced, weighty, and has a smooth, satin finish, which I found to be quite effective for pushing the clay around and minimizing tool marks. The tools are double-ended with different-sized shapers, scrapers, cutters, and dimplers, but any part of the tools can be used. I tested (okay, "played with") the tools on some polymer clay I grabbed from my stash. As I worked, I found myself using the sides of the tools as well as the ends to get the effect I was looking for. The transitions between the various parts of the tool are smooth, so if you need a specific curve or angle, you can likely find it on one of the tools. I liken them to French curves for clay.

These tools are great. Try them, and I'm sure you'll agree. As for me, I'll be getting a set for myself, and if you hear me "cooing" in my studio, you'll know why! —*Annie Pennington*

WHERE TO BUY

tools shown above, left to right
Can't Live Without It (CLWI) Tool: $20.00
The Pretty Darn Nifty (PDN) Tool: $20.00
Gotta Have It (GHI) Tool: $20.00
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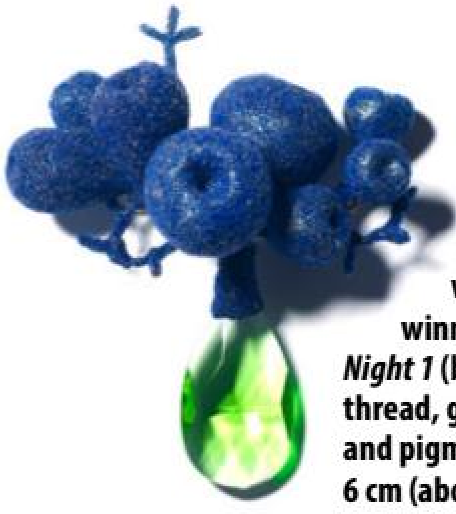
www.christifriesen.com

CALL FOR ENTRIES

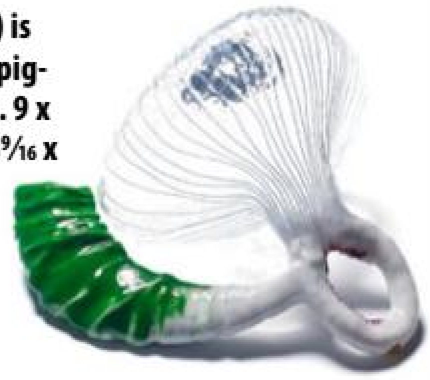
Art Jewelry Forum Artist Award

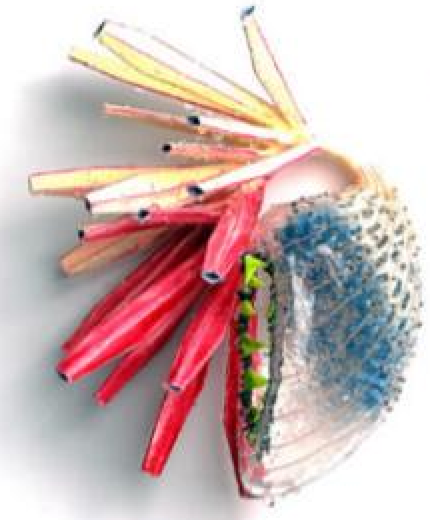
What: Art Jewelry Forum (not associated with *Art Jewelry* magazine) is a global nonprofit organization dedicated to supporting the creation, study, and appreciation of art jewelry. Through this annual award, they acknowledge a jewelry artist's promise, innovation, and individuality. Now in its 16th year, the award provides a cash prize to the winner, and the opportunity for the winner and four finalists to exhibit their work during Munich Jewelry Week in March 2016. Jewelers ages 35 or younger at the time of application and not currently enrolled in a professional training or academic program are eligible to apply.
When: Entries due November 15, 2015
For application guidelines: www.artjewelryforum.org



◀ **Seulgi Kwon was the 2014 winner. *Deep in the Night 1* (brooch) mixes thread, glass, silicone, and pigment. 18 x 17 x 6 cm (about 7 x $6\frac{3}{4}$ x $2\frac{3}{8}$ in.).** All photos by the artist.

▶ ***Still Life 1* (ring) is made of silicone, pigment, and thread. 9 x 10 x 6 cm (about $3\frac{9}{16}$ x $3\frac{15}{16}$ x $2\frac{3}{8}$ in.).**



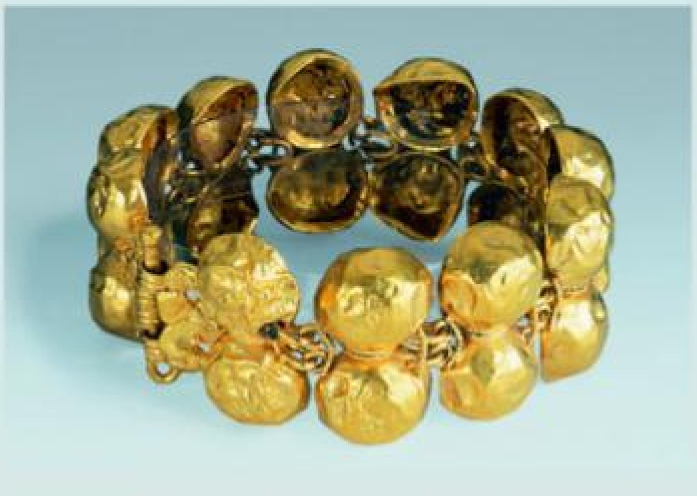


◀ **Kwon's brooch, *The Evolution of Defense 2,* is constructed of silicone, pigment, thread, paper, and plastic. 14 x 11 x 6 cm ($5\frac{1}{2}$ x $4\frac{1}{2}$ x $2\frac{3}{8}$ in.).**

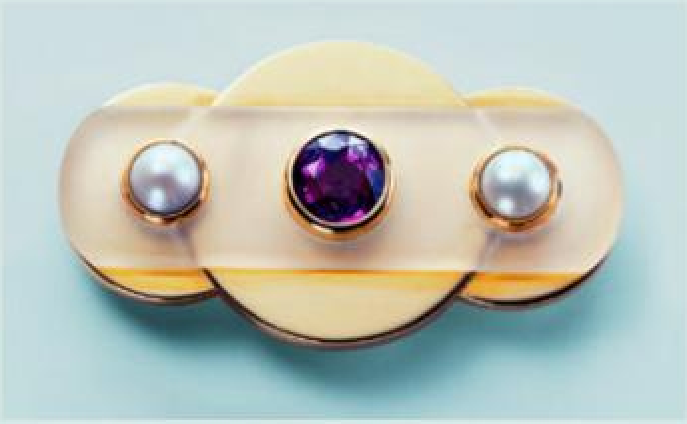
EXHIBITION

The Feel of the City: Jewellery from Centres of this World

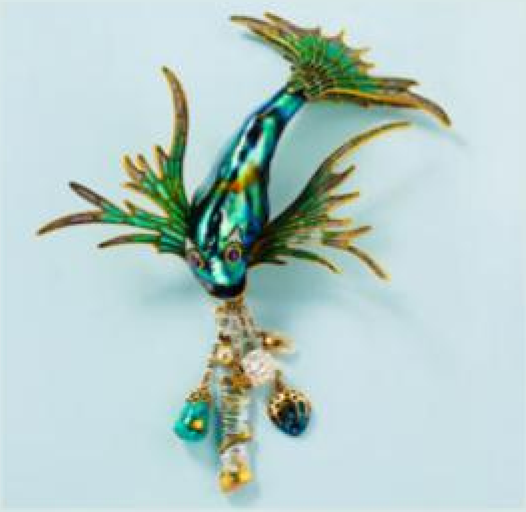
What: Experience a collection of jewelry creations from the world's metropolises, dating from classical antiquity to well into the 20th century. On view are works from the centers of bygone epochs, such as Pompeii, Byzantium, and Constantinople, as well as from trading cities of early modern times, including Paris and Berlin. Whether it's a solid-gold bracelet from Pompeii that exemplifies the competition that was common between the skilled artisans who settled in the cities, or an example from the Baroque period (when jewelry was often the "admission ticket" to court life), the urban jewelry on display reflects the fashion and lifestyle of specific historical eras.
When: Through November 1, 2015
Where: Schmuckmuseum Pforzheim (Pforzheim Jewellery Museum), Pforzheim, Germany
For more information: www.schmuckmuseum.de AJ



◀ **This gold bracelet is from 1st century CE Pompeii or Herculaneum.** Courtesy of Schmuckmuseum Pforzheim. All photos by Günther Meyer.



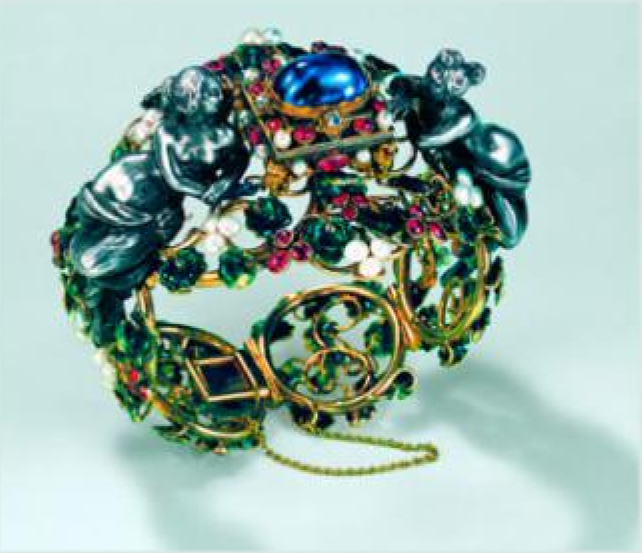
▲ **An Art Deco brooch by Jean Fouquet, made of gold, rock crystal, tourmaline, and cultured pearls, evokes gear wheels and industrial processes. Paris, ca. 1931.** Courtesy of VG Bild-Kunst, Bonn 2015.



▲ **This Art Nouveau corsage adornment by Georges Fouquet features a large mother-of-pearl element in the shape of a fish. Paris, 1900.** On permanent loan from the Sparkasse Pforzheim Calw Art Foundation. Courtesy of VG Bild-Kunst, Bonn 2015.

▶ **Ornate and decorative, this figurative bracelet of gold, silver, enamel, diamonds, ruby, and sapphire is a collaborative piece by Jules Wièse and François-Désiré. Paris, 1850–55.**

Courtesy of Schmuckmuseum Pforzheim.



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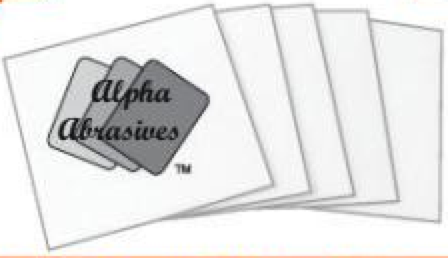

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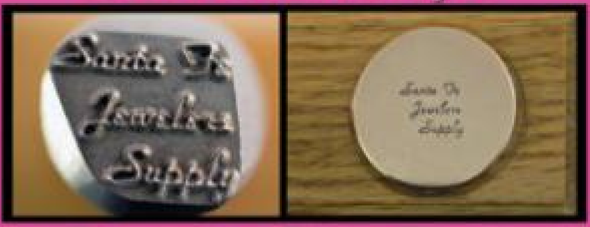

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19 No-brainers for Self-promotion

by Marlene Richey

Just because something is apparent, that doesn't mean that it doesn't need to be spelled out on occasion. Thomas Jefferson, after all, spent the second paragraph of the Declaration of Independence stating and expanding upon "self-evident" truths — he didn't just write, "Duh." In this column, I'm going to share some ideas for easy, inexpensive things you can do to market your art-based business. These are so self-evident that many of you may roll your eyes and say, "I *know* that." But I have to tell you, there are things on this list I forget, and I teach marketing and promotion! So as you read through the list, be honest with yourself about where you can make improvements. Get creative. Get innovative. Get audacious. Get inspired.

1 Wear your jewelry.

Once you start selling your jewelry, never leave home without wearing your work. And certainly never leave home wearing someone else's work. Jewelry is a conversation starter, and you don't want to start a conversation about someone else's business.

2 Carry business cards.

You never know when you're going to run into someone on a train or in an elevator who loves your work. Be ready for it. If you have business cards with you, it's simple to pull one out and hand it to your potential customer. Having a card on hand ensures not only that the potential contact is not lost as soon as the elevator doors open, but you look professional and proactive.

3 Have your speech ready.

Speaking of elevators … have your elevator speech prepared and memorized. An elevator speech is a short, engaging pitch which tells someone about your product, your business, and yourself in under 60 seconds — roughly the length of an elevator ride. Create a few versions in different lengths: a tagline or two words; a two-sentence description; and a two-paragraph description. Use the same words and convey the same thoughts, just in lengths suited to either a two-floor stop or a ride to the penthouse!

4 Get involved.

"Network" can be a scary word; it can sound a little cold-blooded. But don't think about networking as making contacts you wouldn't otherwise want. Whenever you participate in local business, jewelry, and social organizations, you meet people with common interests and overlapping skills. Those people are potential customers and service providers. You can't just do it online; you need to meet people face-to-face. Volunteer. Participate.

5 Work the press.

Create an editorial mailing list and send out press releases to editors of publications and blogs whenever you launch a new piece of jewelry or have news. However, don't send them a news blast every week — if you wear out your welcome, they'll eventually stop opening your email. Space it out: Try a two-month schedule for press releases.

6 Get the picture.

Have good images ready to go. The last thing you want is for an editor to call you for an image and have to tell them that you'll have to schedule a photo shoot first. Make sure you have images of print quality — most newspapers and magazines will need images at 300 dpi or higher. Keep the background clean; don't give in to the lure of props! Have your images shot on a white background. When given a choice of a pearl ring shot on a graduated grey or beach-stone background and one shot on white, editors most often pick the white. White backgrounds make it easier for editors to drop an image into an article.

7 Show up.

Offer to make personal appearances at retail stores who are clients. This gives you the chance to meet their customers, see how the store displays your work, get to know their staff, and hopefully make some money. Most stores love these sort of benefits from their artists.

8 Keep in touch.

Create mailing lists for wholesale and retail clients, keep them up to date, and use them! Send out newsletters. Send out postcards (still one of the strongest

advertising mediums). Be proactive and contact your stores a couple of times a year to see how they are doing and if they need more merchandise.

9 Stay informed.

If you make and sell jewelry, I assume that you love jewelry, so how burdensome is it, really, to stay informed about your chosen field? Read and watch everything you can about jewelry, business, accounting, fashion, trends, and sales. Follow blogs and get on mailing lists for businesses you particularly like. TED Talks (www.ted.com/talks) are a wonderful source of information, and are entertaining, too!

10 Ask for advice.

We all have people whom we admire, and who seem to have their act together when it comes to their business sense. Don't be shy about asking for advice! It doesn't matter if they're in the same field as you. (In fact, you may feel more comfortable asking someone with whom you won't be competing!) Ask for their one word of advice about how they got to where they are. I did this when I opened a gallery and received some great suggestions. You're only tying the person up for a couple of minutes, and you're making them the expert.

11 Have a plan.

Write out a marketing plan describing your marketing goals and how you plan to achieve them. Account for the cost and the time in creating these goals. Aiming small is absolutely fine; it'll get you on the right track and give you a firm sense of what's needed to accomplish just that much before you aim higher.

12 Know your buyer.

Draw up a profile of your ultimate customer; describe him or her in detail. Do they like music festivals, craft fairs, or church events? Do they belong to garden clubs or the local PTA? Are they parents or just getting married? Are they teenagers or baby boomers?

13 Cross promote.

Check out other local businesses, such as restaurants and hotels. If they're hosting an event, see if you can participate. Is a large corporation having an annual conference where you could set up a small booth? Art walks and studio openings are a great way to generate interest in your work. Local salons or spas might be interested in carrying a selection of jewelry that would suit their clientele.

14 Brand yourself.

Choose a color. Choose a font. Have a recognizable logo. Make sure everything that you create for your business reflects and enhances your brand. Your business cards, handouts, website, Facebook page, packaging, booth — even the message on your answering machine — should all send out a strong, cohesive message. What can someone tell about you and your business before seeing your product?

15 Be real.

Hand-write holiday cards and thank you notes. "Real" paper cards say that you care enough to take the time to send them. They get opened, they get noticed, and they are remembered. And when it comes to choosing stationery and cards … see #14!

16 Watch what they say.

Word-of-mouth is a powerful tool, especially in the Internet age when "personal" recommendations can go viral with the push of a "share" button. Make sure the things being said about you are positive. Of course, the underlying message of this point is to make sure you don't give people cause to say negative things about you.

17 Enter competitions.

Too many jewelry makers see competitions as an added extra that don't serve a purpose beyond vanity. But think of competitions as a low-risk way to get lots of exposure. First of all, *not* winning is no big deal. Usually, you keep the jewelry, so you've lost nothing; you don't have to tell anyone that you entered, so there's no loss of face; and you'll learn a lot that you can use when you enter next year. But if you do win? First of all, you are now entitled to use that powerful descriptor: "Award-winning!" And, you get free press, and the contest organizers take care of the marketing.

18 Go shopping.

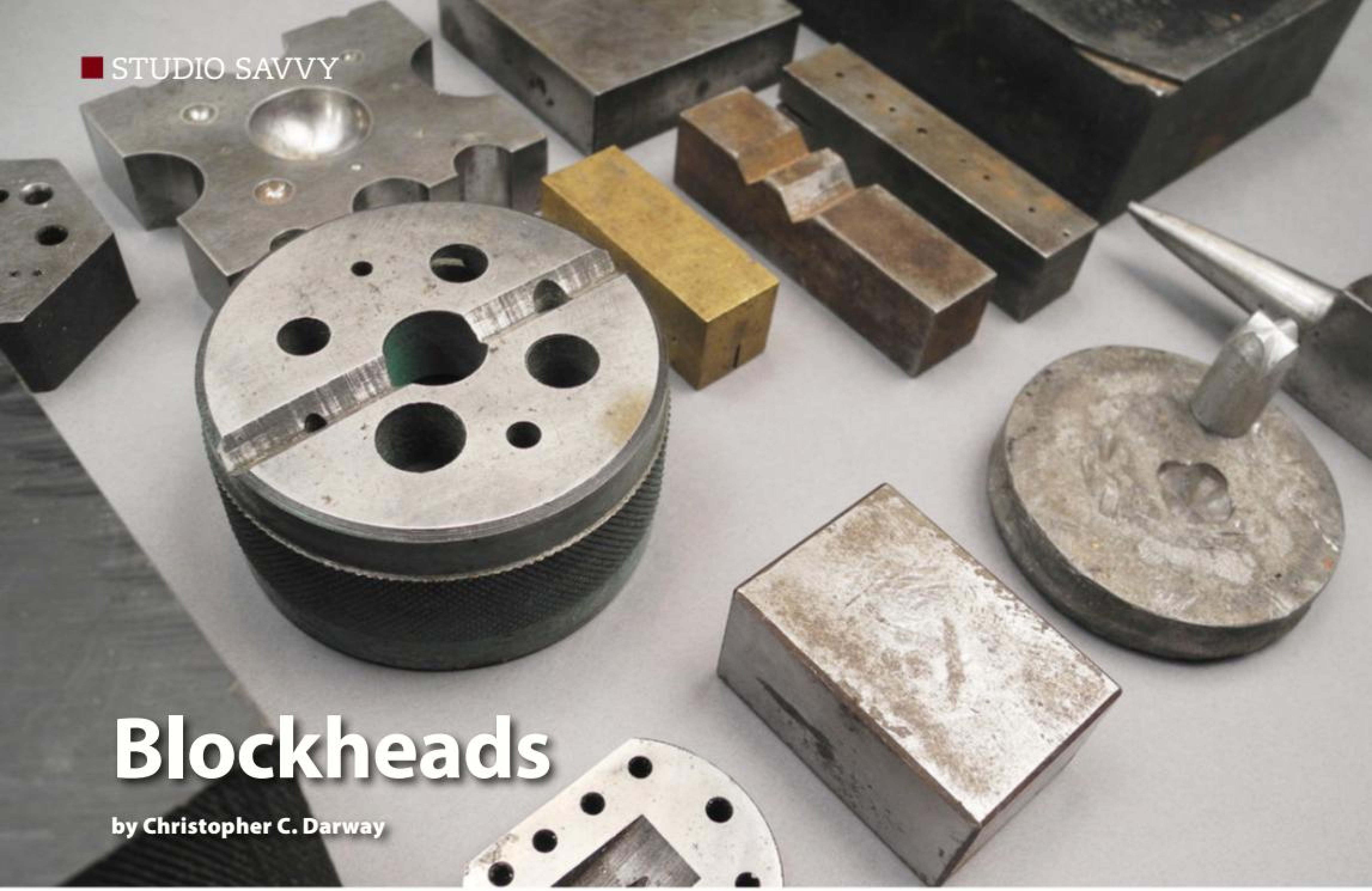
Visit local stores to see the work they sell and what services they might need. See how your work fits into their inventory, and think about how you can be of service to them.

19 Get online.

Use social media to promote, market, and enhance your brand. But then, you know that already. You should be making three to five posts a week.

So there you have it. A host of self-evident points that may have slipped from your mind. Consider this your reminder. And remember, your marketing plans won't work unless you do!

In her more than 30 years in the jewelry business, Marlene Richey has run a wholesale business and a retail gallery. She can be reached by email at marlenerichey@gmail.com.



Blockheads

by Christopher C. Darway

A bit of free association: I started thinking about Ian Dury and the Blockheads, which led me to hammer heads, bench blocks, music, beats, noise, gunsmiths, punk, and jewelry. At the time, about an hour ago, it all really made sense to me. One thing these all have in common is their relationship to the word "hit." In a metals studio, many things call out, "Hit me." Bench blocks are just one of those things.

The bench block

There are times you need a clean, flat, and hard surface to hammer upon, straighten wire, support a center punch or hallmark stamp, and align edges. Anvils are one way to go, but your need might be a little more intimate, so it's nice to have a bench block.

Square/rectangular

A bench block is also called a "flat anvil" because it has no horn. They are usually made from a steel alloy, and the surface is case hardened (see "Case Hardening," *opposite page*). They come in different sizes — from 2½ x 2½ x ¾-in. (64 x 64 x 19 mm) squares to 10 x 8 x ¾-in. (25.4 x 20.3 x 1.9 cm) rectangles — and are reasonably priced. Any piece of steel can be used as a bench block, though. There are no set dimensions, hardnesses, or shapes that make for an *official* bench block. Case in point: I have a piece of 8 x 6 x 1½-in. (20.3 x 15.2 x 3.8 cm) steel that weighs in at 10 lbs. (160 oz). My grandfather brought it home one day from the Brooklyn Navy Yard. According to family legend, it was a scrap piece of battleship armorplate. I believe it. It is the densest and heaviest piece of metal I've ever handled. Nothing hurts it. It's overkill, but it's fun when I drag it out.

Round

There are also round bench blocks. These tend to be the size of a hockey puck and come with a hard rubber holder, which helps cut down on noise (*above right*). Some have a flip-side made of nylon. They can also be held in a vise for forming metal (use copper vise-jaw protectors to avoid marring the block's surface). One advantage of a square block over a round one, however, is that the straight edges can be used to make tight bends in metal sheet.

Machinist's blocks

This variation of the round bench block has a V-shaped groove across the top surface, and has numerous holes both on the flat surface and in the bottom of the V-groove (*above left*). You can buy these from jewelry or gun-tool suppliers. They are used to drive out pins, set rivets, and hold round tubing and wire when using a drill press.

Photos by Christopher C. Darway.

case hardening

Case hardening is a process that adds carbon to the surface of low-to-medium-carbon iron or steel; this increases its hardness at the surface while keeping the core soft. The main idea is to heat the metal and then bury it in a carbon-rich powder. There's more to it than that, but that's the gist of it. Gun-tool suppliers sell a commercial compound called Kasenit, which I've used to harden chasing tools when the steel I used to make them was of dubious origin. Kasenit contains mostly sodium ferrocyanide, and is easy to use. Read the instructions: It sounds more dangerous than it is. It's used commercially to prevent road salt from caking, and to coat welding rod.

Old machine-shop recipe (by weight): 13 parts hardwood charcoal, three parts barium carbonate, two parts sodium carbonate, and one part calcium carbonate.

Riveting stakes

There is also a subset of specialized bench blocks, most of which are related to riveting. You'll find them called riveting stakes, hex blocks, and bench anvils, and they're available in round, hexagonal, square, oblong, and rectangular profiles. They have a variety of holes for rivet wire, and enough flat surface area to hammer on.

Designer dapping blocks

In the riveting-stakes subset lives the designer dapping block. These have several indentations like a dapping block, but include cutout shapes on the sides for forming wire and sheet.

Bench anvils

Bench anvils look like, well, small anvils. The cheapest are not worth the metal they were cast from: usually very soft iron. They work, but the surface will show hammer marks in short notice. Since they're anvils, they will have a horn to form metal on. They are rarely finished well, and have a painted surface. Be sure you get a quality one. I recently saw a cute horned anvil made by Pepetools which is machined (not cast) from tool steel, case hardened, and made in Ukraine. Hey, they're my people!

Material variations

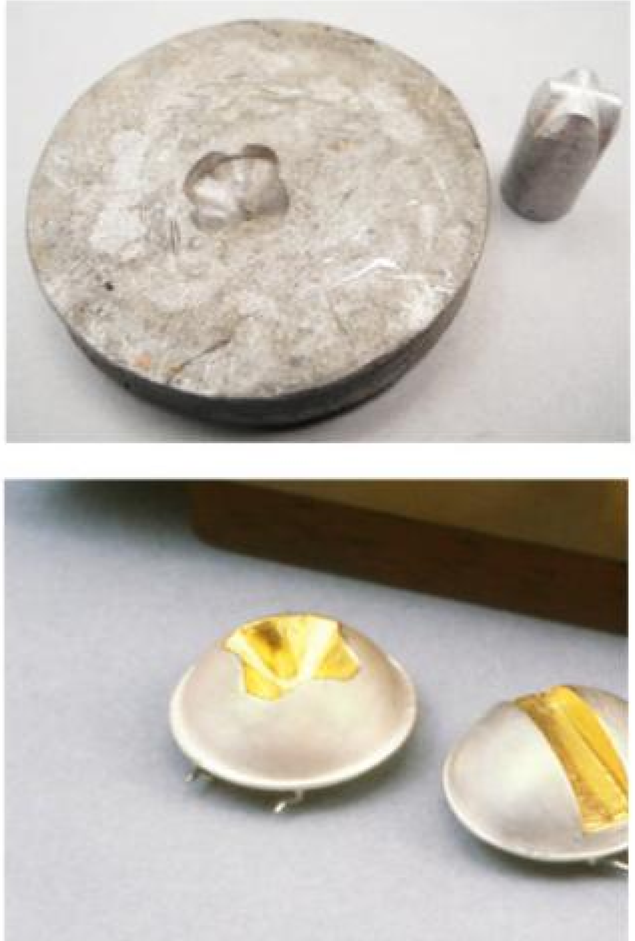
Plastic

Gunsmiths use hard plastic or nylon versions of a round machinist's block. The plastic prevents marring patinas and finishes on gun barrels and other highly finished parts. I have a block of ABS (black) plastic which serves as a non-marring surface on which to hammer metal. Nylon and Delrin work equally well.

An advantage of these materials over steel is the ability to use a band or table saw to cut custom sizes and shapes. You can use burs with a rotary tool to grind out additional shapes.

Lead blocks

A lead block is a tool that's been used by jewelers and silversmiths for a thousand years. Most jewelry suppliers sell them. The English use the term "lead cake" or "lead biscuit" when referring to a lead block: When recasting a used lead block, a biscuit tin is used as a mold. Quaint. If you're inclined to try this technique, make sure there's proper ventilation, oil the tin, and melt the lead in a cast-iron ladle.



Darway used a lead block and aluminum pusher (*top*) in a hydraulic press to form this sterling silver and Keum-boo Phillips-head brooch (*bottom*).

How do you use a lead block? Think of striking a dapping punch into a dapping block. The lead block substitutes for the dapping block. I've used my hydraulic press to sink a shape into a lead block to become the negative shape to form a design (*below left*).

Here are some additional safety tips for working with lead:

- Wear cotton gloves when working with lead, and always wash your hands after handling it.
- Keep all traces of lead contained. Lead and pewter alloys can (and will!) contaminate silver. When you anneal or solder silver, a tiny piece of lead or pewter will melt into the silver and ruin it. You'll have to scrape the "stain" out of the silver, and even then it might not be salvageable. Send the silver to your refiner.

Hardwood

Hardwood blocks, either flat or with round and oval indentations, are also useful. Watchmakers use wood blocks with shallow indentations to reshape dented pocket-watch shells. And, wood is less liable to mar soft metals than steel or other metal surfaces.

Other materials

Other materials that might work for you include aluminum, brass, acrylic, a hockey puck, a discarded disk-brake rotor, or a polyethylene cutting board.

As with all jewelry tools, buy what is affordable, geared to your style of work, and meets your required standard of quality. Your bench block can look like Ian Dury or one of those '80s boy bands. Your call.

Christopher C. Darway can be reached via email at cdarway@outlook.com.

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Measuring & Marking

by Michael David Sturlin

Whether you're a metalsmith, a baker, or a candlestick maker, successful results almost always depend on measuring something. For jewelry makers, the very nature of the craft involves lots of measurements. If you want elements to fit together properly, or a ring to fit a finger comfortably, you need to measure.

Quoting my mentor, Alan Revere: "The most critical step in making jewelry is layout." After four decades at the bench, I can attest to the accuracy of that statement. The more well crafted the work, the more likely it is that the first tools used on the project involved measuring and marking. The importance this plays to every step that follows is paramount.

Our metric is our system

Goldsmiths and jewelry makers commonly use the metric system. Fitting the scale of work, the millimeter (mm) is the standard unit of measure. This unit (one thousandth of a meter) promotes the precision needed in the work. A millimeter is further divisible into decimals for when you need even smaller increments of measure.

The mental conversion from inch to millimeter is simple when you have the proper measuring tools. If you still think in inches and feet, here's the simple math to help you make the transition:

1 in. = 25.4 mm

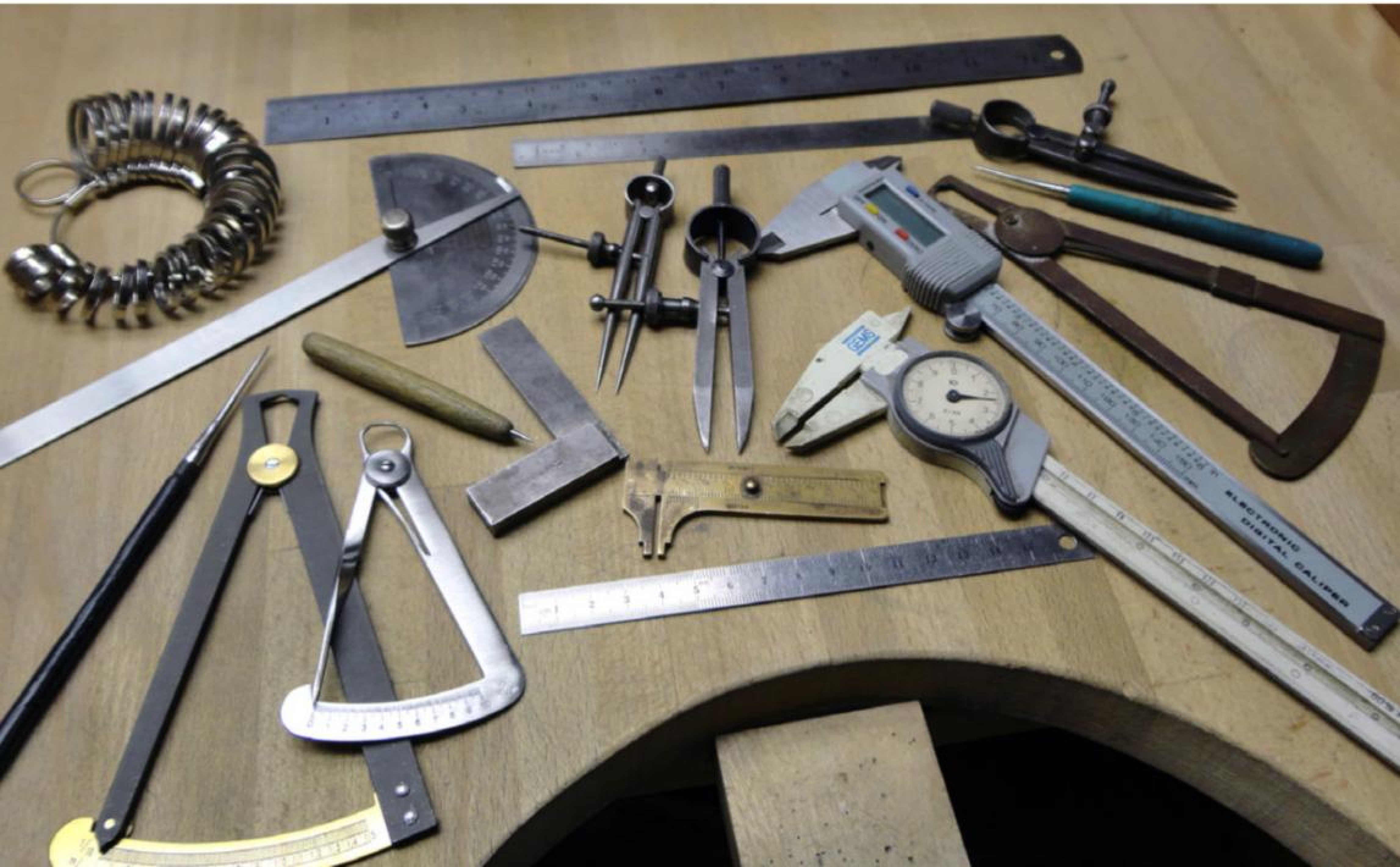
On your mark, get set, go!

Measuring and marking go together, and require only a few basic, inexpensive tools.

Measuring tools

Ruler: Measures length

Sliding caliper: Sliding jaws measure distance. Common types of calipers are Vernier, dial, and digital. Most dial and digital calipers have several measuring capabilities: The large jaws measure outside diameter; the smaller, pointed tips measure inside diameter; the pin that extends from the bottom of the tool measures depth/height; the front



edge of the sliding jaw measures offset.
Spring gauge: Measures thickness; especially useful for interiors where a sliding caliper isn't practical
Micrometer: A screw-adjustment device for measuring thickness of sheet and wire to 0.01 mm
Protractor: Measures angles, slopes, and inclines
Ring sizers: A set of graduated bands for measuring finger sizes

Marking tools

Dividers: Two-legged, adjustable device used for scribing circles, making incremental divisions, marking straight lines parallel to an edge, and transferring exact measurements to metal or wire from a ruler or other object.
Scribe: Pointed steel tool for making precise scratch marks on metal
Machinist's square: Provides a 90° corner for marking accurate right angles

Not just width and height

Aside from frequent measurements of materials (length, width, height, and thickness), there are other critical measures commonly used in jewelry making:

Angle: The interval of space between nonparallel lines, whether emanating from a common starting point (vertex) such as a corner, or the relationship between intersecting lines. An angle is expressed in degrees, representing parts of a 360° circle.
Diameter (D): The distance across a circle at its widest point. **D = 2r**
Radius (r): The distance from the center of a circle to the perimeter. **r = ½D**
Circumference (circ): The length of the perimeter of a circle. **circ = D x π** or **circ = 2r x π** (π=3.14)
Weight: The precious-metal standard measure of weight is the troy ounce.
1 ozt = 31.1 g = 20 dwt (pennyweight)
The gemstone standard of weight is the carat (ct). **5 cts = 1 g**

to gauge or not to gauge

Gauge is both a verb and a noun, although many jewelry makers think of it as only a measurement.

Gauge *verb* **1:** to determine dimensions or measurements **2:** to mark or measure **3:** to appraise, estimate, evaluate, or judge
Gauge *noun* **1:** a standard of measure **2:** a standard dimension or size **3:** an instrument or device used to measure **4:** a judgement or estimation

Many jewelry makers think in gauges because retail suppliers list metal by gauge. This use of gauge denotes specific measurements within set parameters.

Several gauge systems have been used in the manufacture of wire and sheet; the earliest recognized systems date to the early 1700s in England.

- **BWG** (Birmingham Wire Gauge), UK
- **B&S** (Brown and Sharpe), UK
- **AWG** (American Wire Gauge), US
- **BS** (British Standard), UK
- **SWG** (new British Standard Wire Gauge), UK

Regardless of the system used, they all represent comparative sizes within a scale; you'll need a good memory or a handy chart to know what a given gauge equals in millimeters or inches. (See "Relative Sizes" chart, **www.artjewelrymag.com/reference**.)

Personally, I find it much simpler to just measure things with any of the tools mentioned here and to start thinking in millimeters rather than gauges. Besides, you won't be able to plug a gauge number into a calculation formula without transposing it into an actual measurement first.

gold conversion factors

(For adjusting the fineness of gold alloys)

Raising the karat of gold
(Increasing fineness by adding gold)

Karat on hand	Desired karat	Factor for amount of 24k to add
10k	14k	0.400
10k	18k	1.332
10k	22k	9.952
14k	18k	0.666
14k	22k	3.964
18k	22k	1.976

Lowering the karat of gold
(Reducing fineness by adding alloy)

Karat on hand	Desired karat	Factor for amount of 24k to add
24k	22k	0.091
24k	18k	0.333
24k	14k	0.714
24k	10k	1.400
22k	18k	0.221
22k	14k	0.571
22k	10k	1.201
18k	14k	0.286
18k	10k	0.800
14k	10k	0.400

Purity (of metal): The amount of precious metal in an alloy. This is measured in decimal percentages for all metals and/or in karat (k) for gold and gold alloys.
Volume: The amount of three-dimensional space a shape or object occupies

Math is easy (once you know the formulas)!

Math is part of all measuring because measuring is, after all, a form of counting. We use calculations — formulas — to determine specific measurements for many jewelry-making processes.

A few simple mathematical formulas

common conversion factors

Multiply the known unit by the given factor to find the unit you are seeking.

Known unit	Desired unit	Factor
carats	grams	0.2
carats	milligrams	200
grams	carats	5
grams	oz. avoir.	0.03527
grams	oz. troy	0.03215
grams	pennyweight	0.64301
kilograms	oz. avoir.	35.274
kilograms	oz. troy	32.1507
kilograms	pennyweight	643.015
kilograms	lb. avoir.	2.2046
kilograms	lb. troy	2.6792
oz. avoirdupois (avoir.)	grams	28.3495
oz. avoir.	oz. troy	0.91146
oz. avoir.	pennyweight	18.2291
oz. avoir.	lb. troy	0.07595
oz. troy (ozt.)	grams	31.1035
oz. troy	oz. avoir.	1.0971
oz. troy	pennyweight	20
oz. troy	lb. avoir.	0.06857
pennyweights (dwt.)	grams	1.5551
pennyweights (dwt.)	oz. avoir.	0.05486
feet	centimeters	30.48
feet	meters	0.3048
meters	feet	3.2808
meters	inches	29.37
meters	yards	1.0936
millimeters	feet	0.00328
millimeters	inches (in.)	0.03937
inches	centimeters	2.54
inches	meters	0.0254
inches	millimeters	25.4
cubic centimeters	cubic inches	0.061
cubic centimeters	U.S. fluid oz.	0.0338
cubic inches	cubic cm	16.387
cubic inches	liters	0.01639
cubic inches	U.S. fluid oz.	0.554

suffice for our most common calculated tasks: making openings for stones or other objects, or making tubes to fit inside one another for stepped settings.

- To determine the length of stock needed for a bezel: **(D of stone + Metal thickness) x π = Length**
- To make an inside bezel (or a tube with a specific OD): **(D of opening in known tube – Metal thickness) x π = Length**
- To make a tube to fit around another tube (or a tube with a specific ID): **(ID needed or OD of known tube + Metal thickness) x π = Length**

Calculating either the ID or OD of an oval requires first calculating the oval's average diameter (D), which can then be plugged into the appropriate formula:

(Height + Width) ÷ 2 = Average D

carat vs. karat

Spelling does matter! ***Carat*** is a unit of measurement that expresses the weight of an object (usually a gemstone). ***Karat*** expresses the purity of metal; it's actually a shorthand way of expressing a percentage.

Conversion is a good thing

It's often necessary to convert measurements from one system to another. This sounds hard but is relatively simple — just multiply by a standard conversion factor, which is easily found on readily available conversion charts (*left*). However, things are potentially more complicated when you need to convert a metal from one material to another. Fortunately, others have already done the math. If you have a known weight and want to calculate the amount of material needed to make the same object in a different material, a conversion factor makes it simple to determine the weight. (See the "Weight Conversion Factors" chart at **www.artjewelrymag.com/reference**.)

Suggested Reading
- *Professional Jewelry Making*, by Alan Revere; Appendix.
- *The Theory and Practice of Goldsmithing*, by Dr. Erhard Brepohl; Appendix.

As an example, the conversion factor for .925 silver (sterling) to .750 gold (18 kt) is 1.48. This means a 10g sterling silver object will weigh 14.8g when made in 18k gold.

Another common bit of jewelry-making math is to adjust the purity or content of an alloy. This conversion factor is necessary to accurately determine the amount of precious metal or alloy material needed to raise or lower the fineness or karat of metal. (See "Gold Conversion Factors" chart, *page 25*.)

A final measurement-conversion necessary for jewelry makers is temperature. The melt and flow temperatures of metal and solders are sometimes listed in both Fahrenheit (F) or Celsius (C), but, if not, it's useful to have a conversion formula or a comparison chart handy.

- To convert Celsius to Fahrenheit: **(°C x 1.8) + 32 = °F**
- To convert Fahrenheit to Celsius: **(°F – 32) ÷ 1.8 = °C**

Precision is your ally

When you're more successful at completing a piece, you'll enjoy both the process and the jewelry you produce more. In metalsmithing, upping the chances of success is often as simple as accurately measuring and correctly marking; this makes the creation of jewelry much more reliable and the result much more satisfying and fulfilling. With that in mind, the familiar adage of the carpenter serves a goldsmith equally as well: "Measure twice, and cut once." AJ

Michael David Sturlin is an award-winning goldsmith, jewelry artist, and educator. Contact him via email at michaelsturlin studio@cox.net.

Go to **www.artjewelrymag.com/reference** to download PDF reference charts for relative sizes, weight-conversion factors, conversions, and gold conversion factors. Plus, check out our handy gold-karat calculator!

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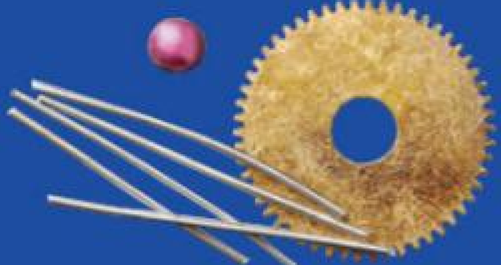

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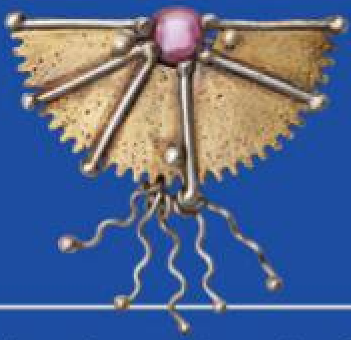

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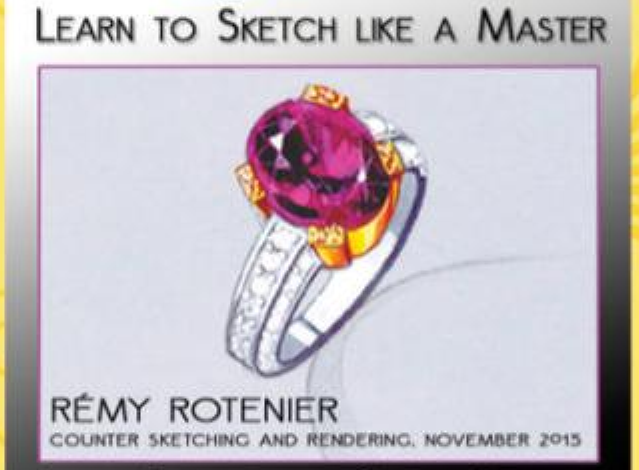

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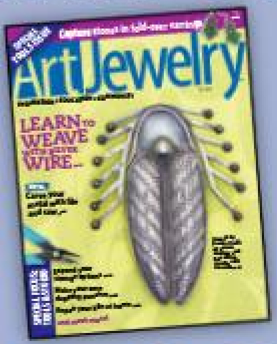

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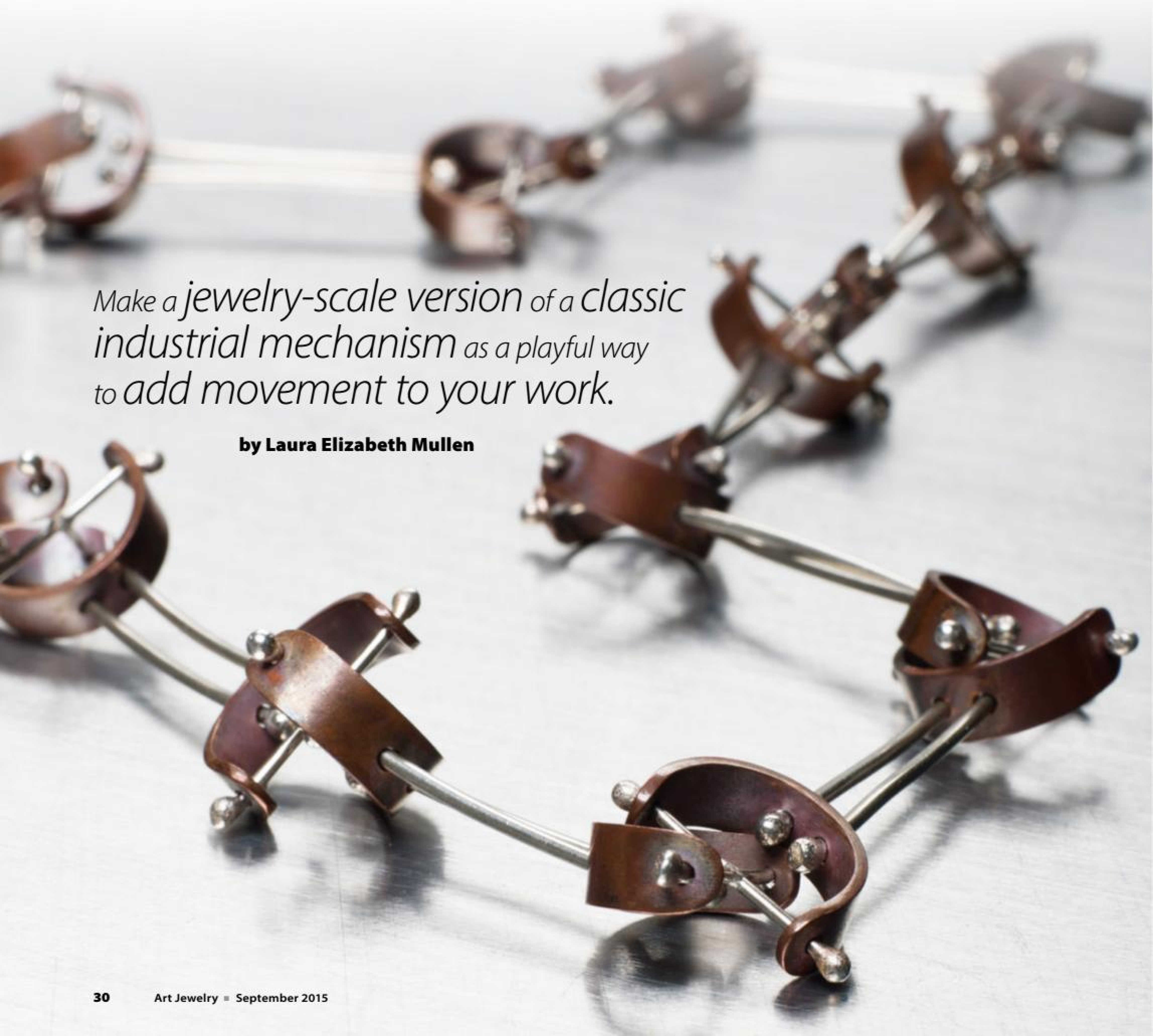
Create a Kinetic Chain with Universal Joints

Make a jewelry-scale version of a classic industrial mechanism as a playful way to add movement to your work.

by Laura Elizabeth Mullen



materials

- Metal sheet: 18-gauge (1.0 mm), 30 x 168 mm (1 3/16 x 6 3/4 in.)
- Sterling silver wire:
  - 16-gauge (1.3 mm), 2.25 m (approximately 2.5 yds.)
  - 18-gauge (1.0 mm), 78 cm (30 3/4 in.)
- Clasp (optional)

toolboxes, page 76

- Sawing/Piercing
- Soldering/Annealing
- Wirework

additional tools & supplies

- Permanent marker or layout fluid
- Ruler
- Machinist's square
- Drill gauge
- Miter jig (optional)
- Split mandrel

Find out where to buy supplies, *page 79*
See Safety Basics, *page 76*

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B Basics, *page 73*
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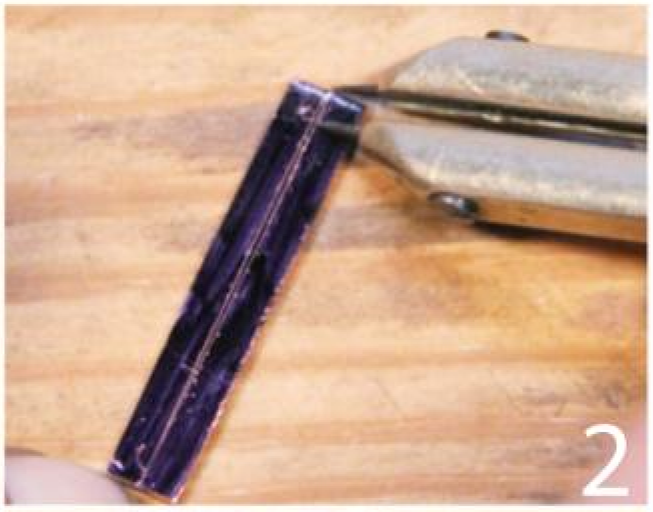
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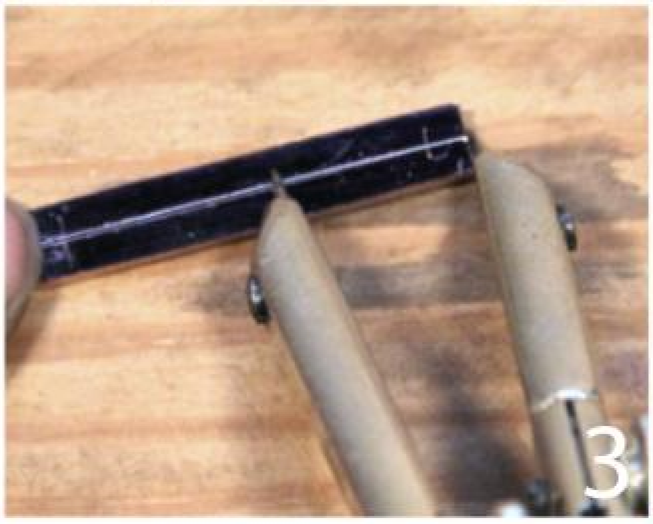
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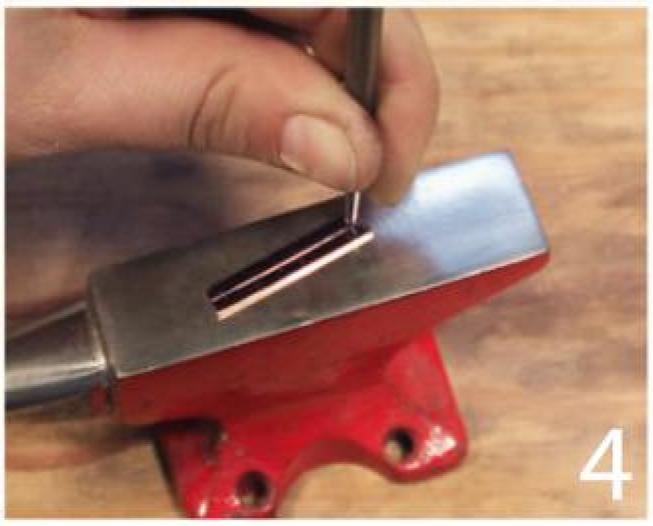
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Inspired by a mechanism found in a car — the driveshaft — this kinetic necklace requires surprisingly simple metal and wire techniques, and a little bit of planning. The X-shaped connection point allows two solid bars (or links, in the case of the chain), to move in all directions, rather than in just one direction, as in a hinge.

Cut the strips. Use a permanent marker or layout fluid to cover the entire surface of a 30 x 168 mm (1 3/16 x 6 3/4-in.) piece of 18-gauge (1.0 mm) metal of your choice (I'm using copper) **[1]**. This makes it easier to see the layout marks.

Use a machinist's square or a ruler and a scribe to mark 28 6 x 30 mm (15/64 x 1 3/16-in.) strips on the metal (see "Tool Spotlight: Machinist's Square," *page 33*).

Use a jeweler's saw with a lubricated 3/0 blade to cut out each strip.

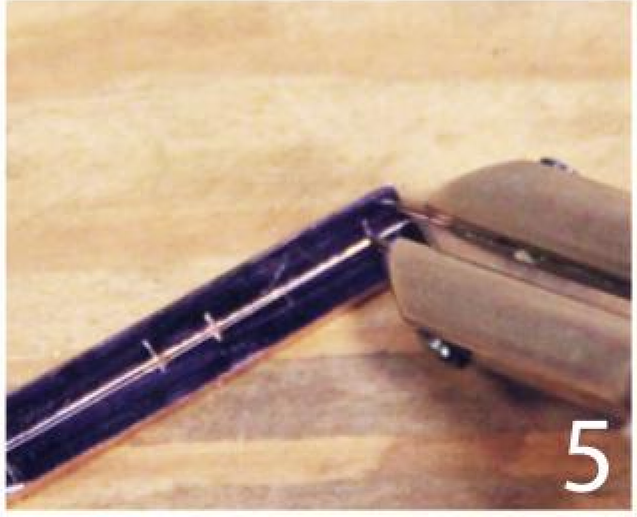
Use a flat hand file (I used a #0-cut mill file) to make sure the ends of each strip are flat, and that the sides are parallel.

Lay out the holes. Set a pair of dividers to 3 mm (1/8 in.). Rest one leg against the side of a strip and one on the surface of the strip. Using the side of the strip as a guide, drag the dividers from one end of the strip to the other, creating a centerline.

Use the dividers to scribe a line 3 mm (1/8 in.) from one end of the strip, perpendicular to the centerline (use the end of the strip as a guide) **[2]**. Repeat for the other end of the strip.

Set the dividers to 13 mm (1/2 in.). Make a short line across the centerline 13 mm (1/2 in.) from each end of the strip **[3]**. There should be four lines intersecting the centerline.

Place the strip on an anvil or bench block, and line up a center punch on one of the 3 mm (1/8-in.) marks on the centerline **[4]**. Use a chasing hammer to strike the punch, creating a divot. Repeat to make a divot at each 3 mm (1/8-in.) and 13 mm (1/2-in.) mark.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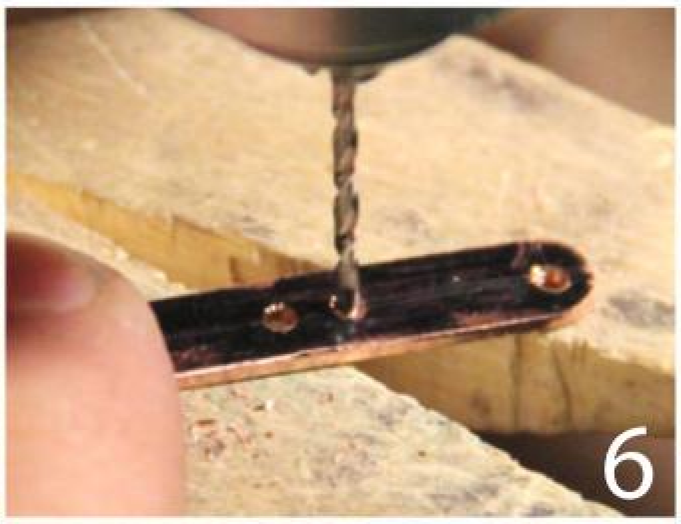
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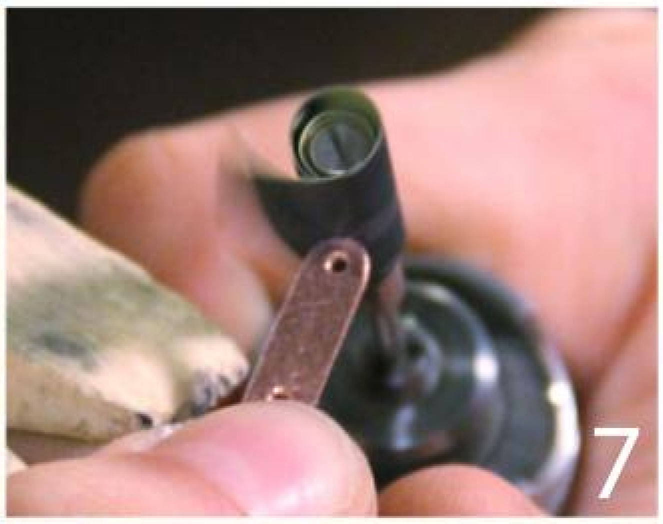
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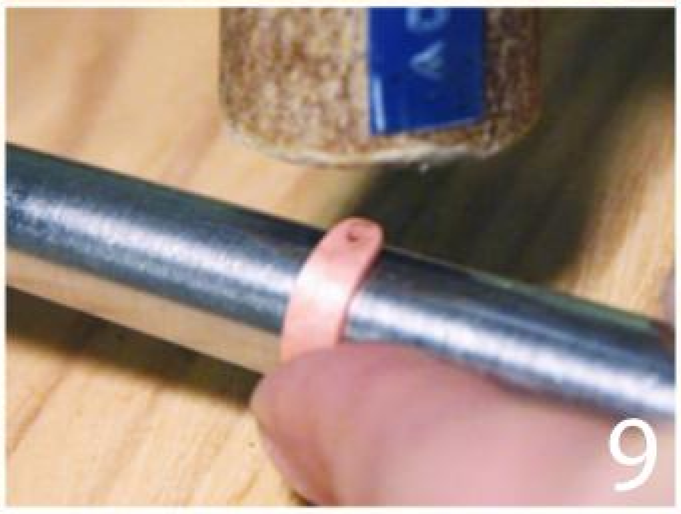
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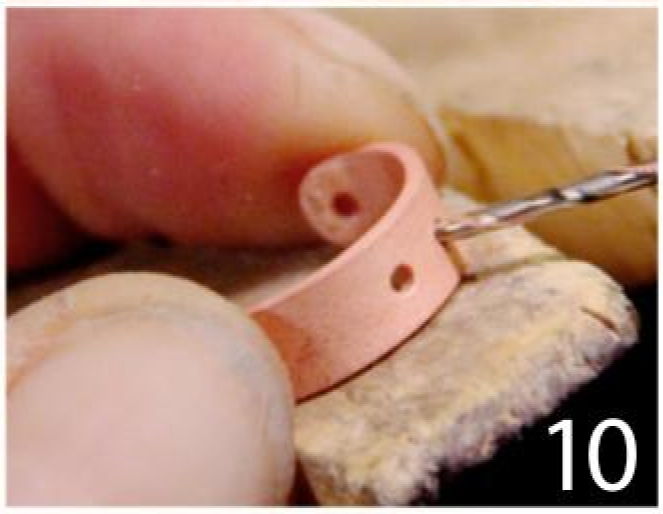
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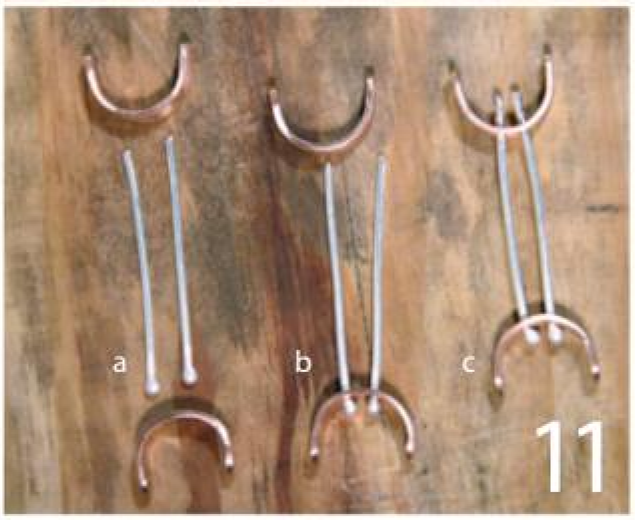

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Round the ends of the strips. Set the dividers back to 3 mm (⅛ in.). Place one leg in the 3 mm (⅛-in.) divot on one end of the strip, and rotate the strip, rather than the dividers, to create a semicircle on one end of the strip **[5]**. Repeat for the opposite end of the strip.

Use the jeweler's saw to cut off the corners of the strip, and use the flat hand file to smooth the ends.

Repeat for the remaining strips.

Drill holes in the strips. Place the strip on a wooden bench pin (or piece of scrap wood), and use a #55 (0.052-in./1.32 mm) drill bit in a flex shaft to drill a hole at each divot **[6]**.

NOTE: If you use a different gauge of wire, use a drill gauge to determine the correct size drill bit for your wire (see "Tool Spotlight: Drill Gauge," *opposite page*).

If you have a hard time holding onto the strips while drilling, use a miter jig instead of your fingers to hold the strip (see "Tool Spotlight: Miter Jig [Drilling]," *opposite page*).

Use a larger drill bit to remove the burrs from around the holes (see "Quick Tip: Removing Burrs," *opposite page*).

Sand the strips. Use a split mandrel in the flex shaft with 320-grit sandpaper to sand the edges, top, and bottom of the strip **[7]** (see "Tool Spotlight: Split Mandrel, *opposite page*). You can use loose sandpaper or sanding sticks, but I find the split mandrel gets the job done faster.

Repeat for the remaining strips.

Anneal the strips. Place the strips on a soldering board or firebrick, and use a torch to anneal them **[8]**. Quench, pickle, rinse, and dry the strips.

Form the strips. Hold one strip against a steel ring mandrel at about the size four or five mark. Use a rawhide or plastic mallet to form it into a semicircle **[9]**. Flip the strip so that the edge that faced the wide end of the mandrel now faces the narrow end, and repeat to ensure it isn't tapered. The holes in the ends of the strip should be aligned. Repeat for the remaining strips.

Forming the strip will slightly distort the holes. Hold a semicircle strip on the bench pin, and use the drill bit to re-open the holes **[10]**. Insert a 51 mm (2-in.) scrap of 18-gauge (1.0 mm) wire through the holes at the end of a strip. If the wire does not fit through both holes, adjust the diameter of the curve in the strip.

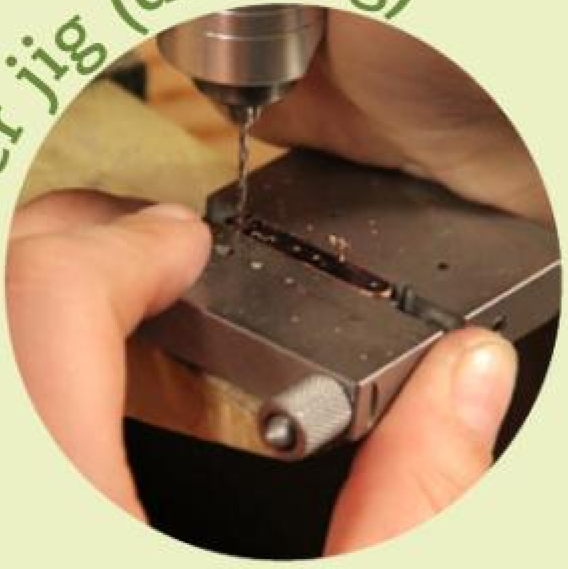
Ball up the connection wires. Use flush cutters to cut 50 45 mm (approximately 1¾-in.)-long pieces of 16-gauge (1.3 mm) wire. I recommend sterling silver because the ends ball up nicely, and it's stronger than copper wire of the same gauge.

Use the torch to ball up one end of each wire. The wires should be about 40 mm (1⁹⁄₁₆ in.) long after the ball is formed (the ball should use about 5 mm [³⁄₁₆ in.] of the wire length). Some variation in length is acceptable, and should be expected. Place the wires in pickle to remove oxidation, then rinse and dry them.

Assemble the links. Each link will be composed of two semicircle strips and two balled-up wires. Lay them out as shown **[11a]**. Insert a balled-up wire through one of the center holes in a semicircle strip with the ball on the concave surface of the semicircle. Add a second wire through the second center hole in the same strip **[11b]**. Insert the straight ends of the wires through the two holes of a second strip **[11c]**. Make

tool spotlight

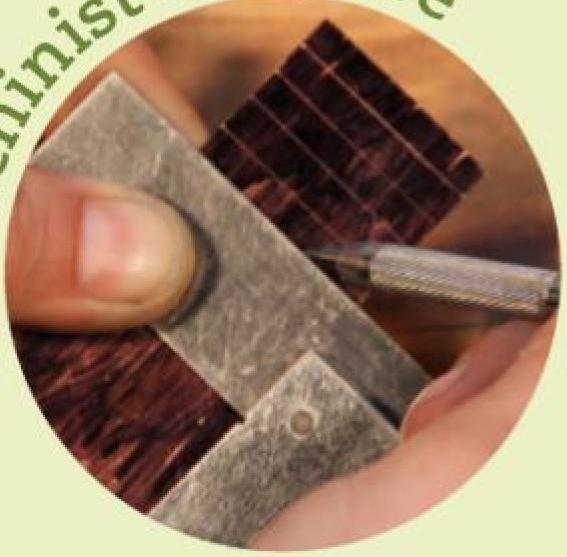
miter jig (drilling)



A miter jig is useful for holding small pieces of metal, such as the strips used in this project, if they get too hot to hold during the drilling process. You can clamp the strips one-at-a-time in a miter jig/vise to protect your fingers. Place the strip on a flat surface, then open the miter jig so that there's enough space for the strip to fit into the jaws widthwise. With the strip and the miter jig flush with the surface, tighten the jig using both knobs. The jig should be snug enough that the piece doesn't fall out, but not so tight that you can't open the jig back up.

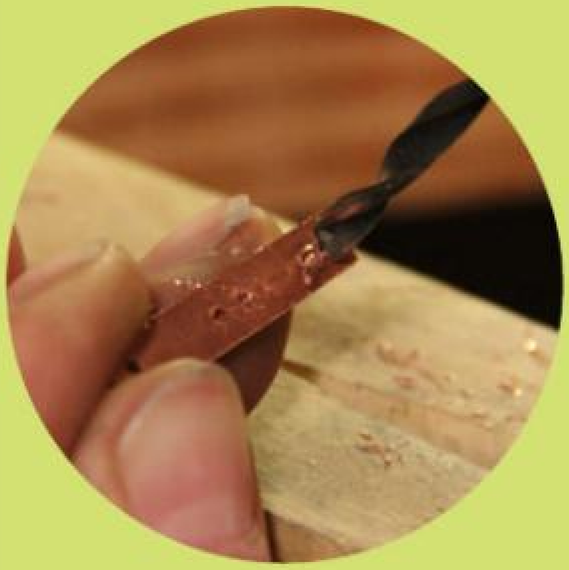
This may also have the added benefit of helping you drill straighter holes through the metal pieces. It takes 50% of the "human condition" out of the equation. If we accept that nothing we make by hand will be exactly perfect or identical each time, then we know that using a flex shaft in one hand while holding the other piece may result in slightly crooked holes. Using the miter jig ensures that the metal is at least perfectly flat.

machinist's square



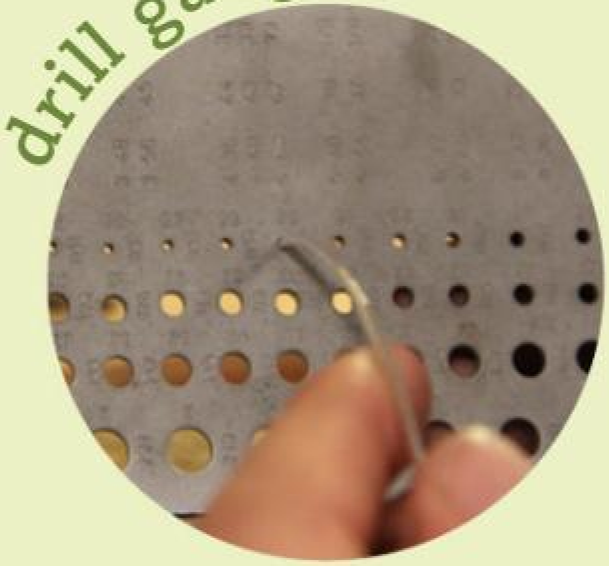
A machinist's square can be used to mark lines that are perpendicular to an edge of a piece of metal (or any other material). To ensure the lines are straight, it's important that the edge you press against the stop on the machinist's square is perfectly straight. I used a black permanent marker to darken my metal to make the scribed lines easier to see, and then used a scribe with the square for precision.

quick tip: removing burrs



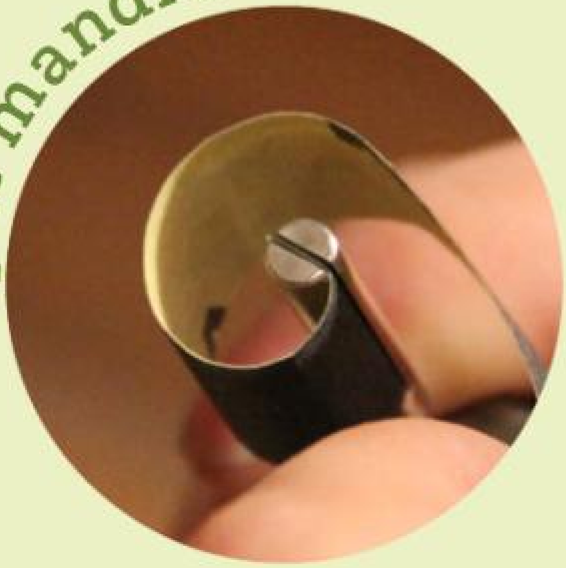
Removing burrs is necessary after drilling a hole in metal. Often, there's extra metal — a sharp burr — left around the hole. You can use a drill bit that is substantially larger than the drilled hole to remove this metal quickly and efficiently. (In the photo, I'm using a #26 [0.147-in./3.73 mm] drill bit to remove the burr from a hole drilled with a #55 [0.052-in./ 1.32 mm] bit.) Hold the larger drill bit in your hand, and insert its tip into the smaller hole. Use light pressure to twist the drill bit until the burr is removed. Repeat on the opposite side of the hole.

drill gauge

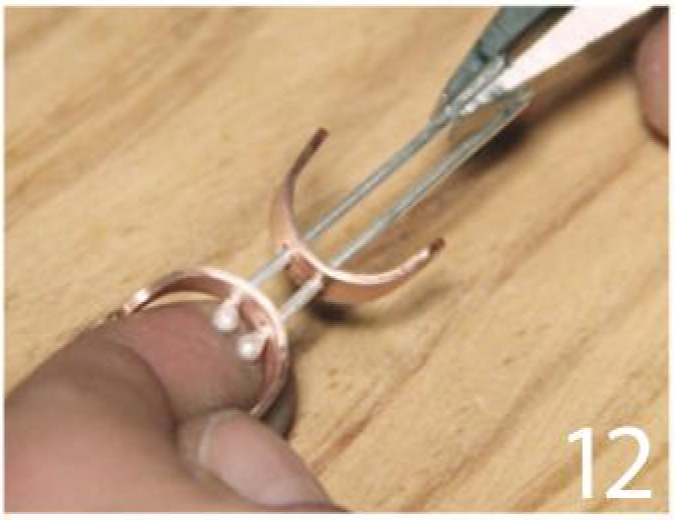


A drill gauge can be used to identify what size drill bit will correspond with a given wire gauge. My gauge measures drill-bit sizes from #1 to #60, and corresponds with a standard 60-piece drill index. Insert your wire through progressively larger or smaller holes until you find the size that fits your wire exactly. If no hole is a perfect fit, choose the size that's a bit too small for the wire, and use a round needle file to gradually enlarge the hole so the wire fits tightly. I used this gauge to determine that I needed a #55 (0.052-in./1.32 mm) drill bit for 16-gauge (1.3 mm) wire.

split mandrel



A split mandrel used with sandpaper expedites the sanding process and works well on edges as well as on flat surfaces. Cut a strip of sandpaper approximately the height of the split in the mandrel and as long as you'd like (I cut mine about 13 x 76 mm [½ x 3 in.]). Insert the sandpaper into a split mandrel so that the grit faces up and the strip comes out of the left side of the mandrel. Wrap the sandpaper strip around the mandrel and bring it to your piece. Once you step on your flex-shaft foot pedal, the spinning sandpaper strip will tighten around the mandrel, and will begin to sand your piece.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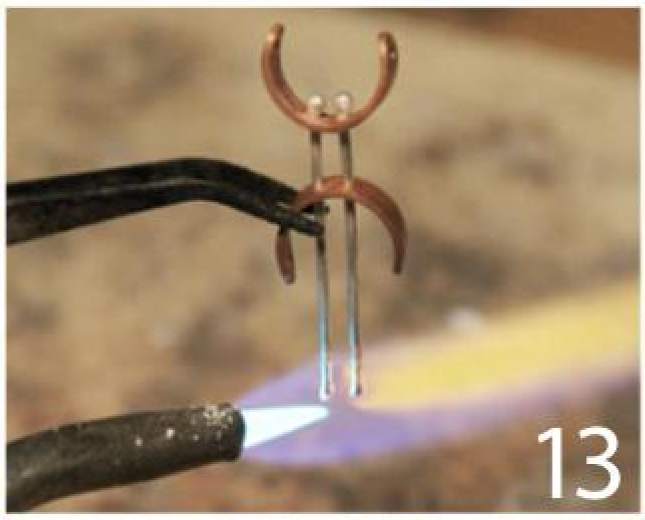
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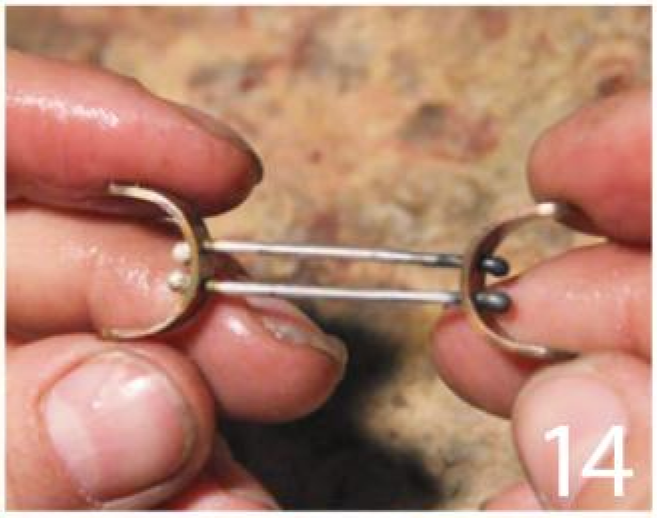
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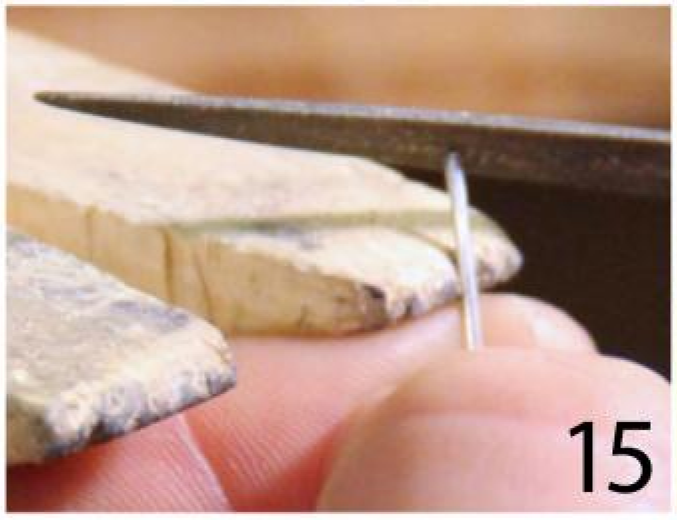
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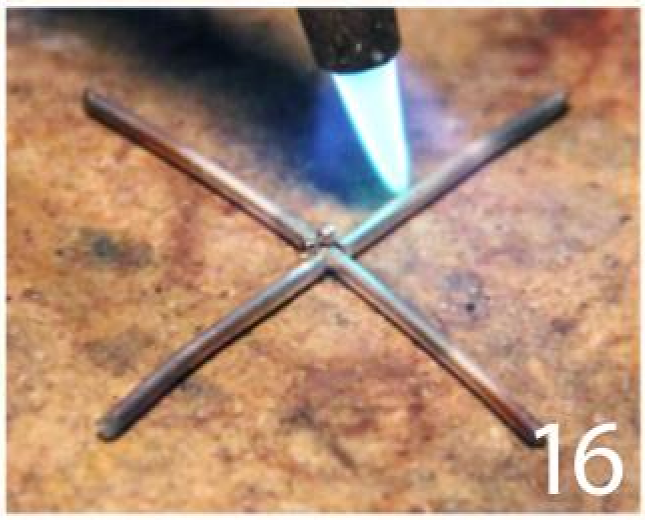
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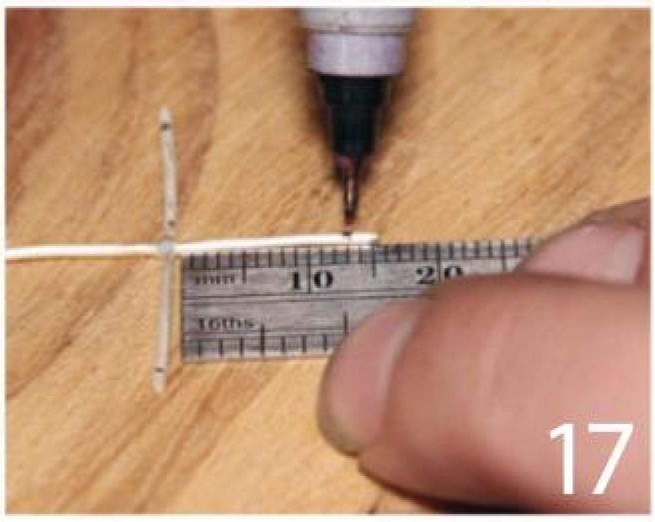
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sure the convex sides of the two strips face each other.

Slide both semicircle strips as close to the balled-up ends as possible. If necessary, use flatnose pliers to straighten the wire ends so that they don't touch **[12]**.

Use a third hand with cross-locking tweezers to hold the second strip with the wire ends pointing down. Make sure the wires don't touch to prevent them from fusing together. Use your torch to ball up the end of each wire **[13]**. Quench the link in water, and then use your fingers to pull the semicircle strips away from each other and snugly against the balled-up ends **[14]**. Pickle, rinse, and dry the links.

Repeat to make 14 links.

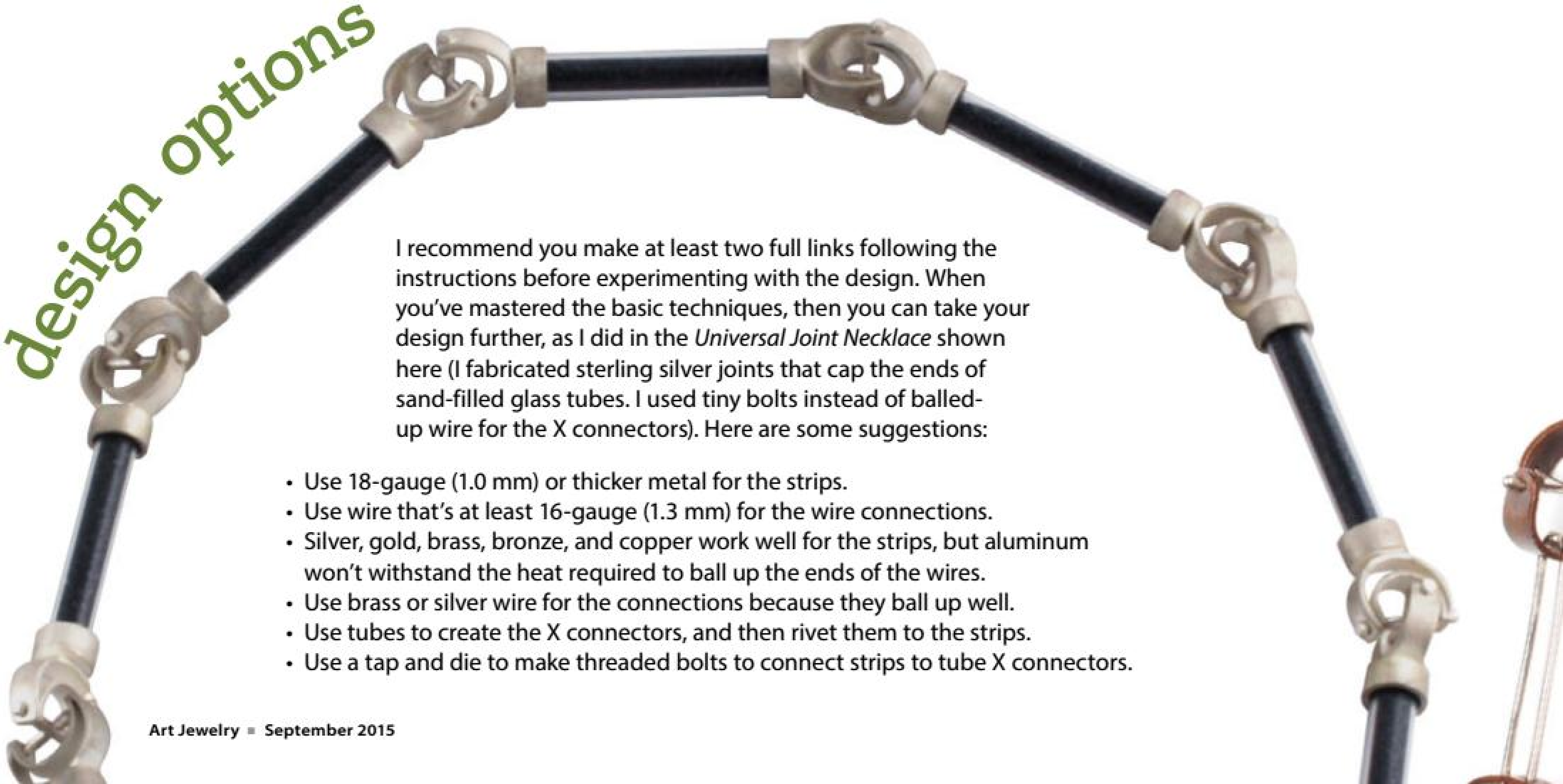
NOTE: This many links makes a necklace that slips over the head with no clasp. If you want a shorter necklace, design and fabricate a clasp, and add it at the appropriate spot on the necklace.

Assemble the X connectors. Use flush cutters to cut eight 30 mm (1³⁄₁₆-in.) and 36 15 mm (¹⁹⁄₃₂-in.) pieces of 18-gauge (1.0 mm) sterling silver wire. Use a fine-tip permanent marker to mark the center of each 30 mm (1³⁄₁₆-in.) wire.

Hold a 15 mm (¹⁹⁄₃₂-in.) wire against a groove in the bench pin, and use a needle file to file the end flat **[15]**. Repeat to file one flat end on each 15 mm (¹⁹⁄₃₂-in.) wire.

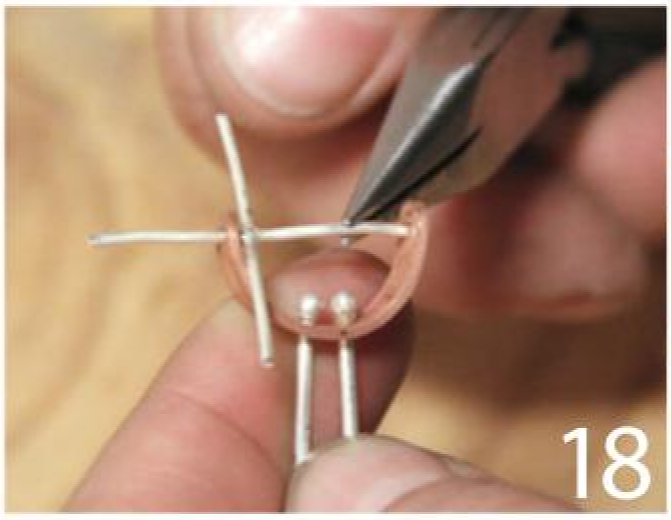
Arrange one 30 mm (1³⁄₁₆-in.) and two 15 mm (¹⁹⁄₃₂-in.) wires in an X shape on your

design options



I recommend you make at least two full links following the instructions before experimenting with the design. When you've mastered the basic techniques, then you can take your design further, as I did in the *Universal Joint Necklace* shown here (I fabricated sterling silver joints that cap the ends of sand-filled glass tubes. I used tiny bolts instead of balled-up wire for the X connectors). Here are some suggestions:

- Use 18-gauge (1.0 mm) or thicker metal for the strips.
- Use wire that's at least 16-gauge (1.3 mm) for the wire connections.
- Silver, gold, brass, bronze, and copper work well for the strips, but aluminum won't withstand the heat required to ball up the ends of the wires.
- Use brass or silver wire for the connections because they ball up well.
- Use tubes to create the X connectors, and then rivet them to the strips.
- Use a tap and die to make threaded bolts to connect strips to tube X connectors.



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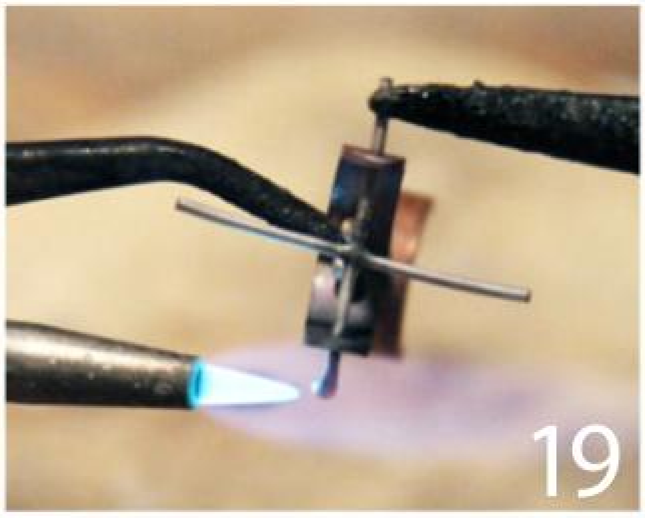

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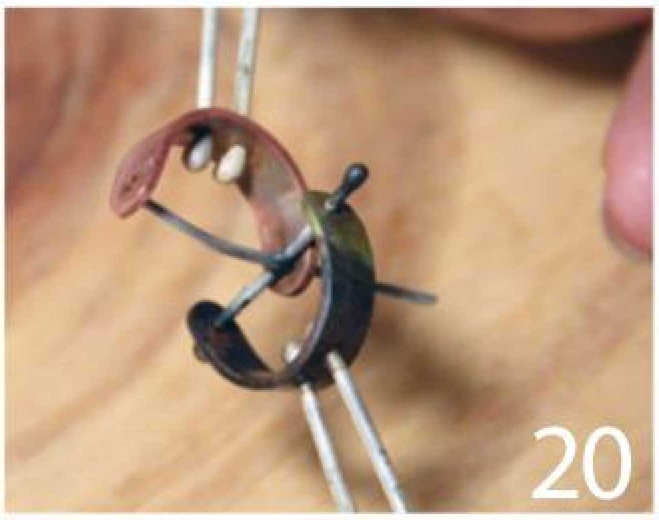

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Process photos by Clayton C. Vermilye.

soldering board. The shorter wires (flat end facing in) should be perpendicular to and centered on the 30 mm ($1\frac{3}{16}$-in.) wire and in line with each other. Apply flux to the joins. Use hard or medium solder to attach the wires at the center of the X **[16]**.

Repeat to solder a total of 28 X connectors. Pickle, rinse, and dry them.

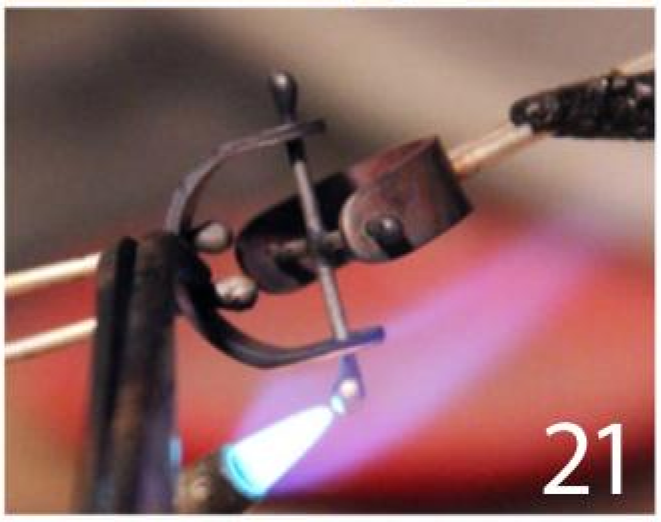
Use the ruler and marker to mark each leg of an X connector 13 mm (½ in.) from the center intersection **[17]**, and use flush cutters to trim them to length. Repeat for the remaining X connectors.

Connect an X connector to one link. Insert one leg of an X connector through the hole in one end of a semicircle strip at the end of a finished link. Slide it through to the center point of the X, and insert the opposite leg through the hole in the other end of the semicircle strip. You may need to use pliers to line up the wire with the hole **[18]**. If the wire bends, straighten it.

Use cross-locking tweezers in a third hand to grasp the semicircle strip at its midpoint with the open ends facing you and the legs of the X connector that are inserted through the holes positioned vertically. Use a second pair of cross-locking tweezers in a third hand to grasp the top leg of the X connector; make sure the center point of the X connector is centered in the semicircle strip.

Use the torch to ball up the bottom end of the X connector **[19]**. Keep the ball at least 2 mm ($\frac{5}{64}$ in.) away from the strip so that the pieces do not fuse together. You can paint yellow ochre (or another antiflux) where the connector touches the strip to make sure they don't fuse together).

Turn the link over, and repeat to ball up the other end of the X connector, making sure to keep it centered in the semicircle strip.



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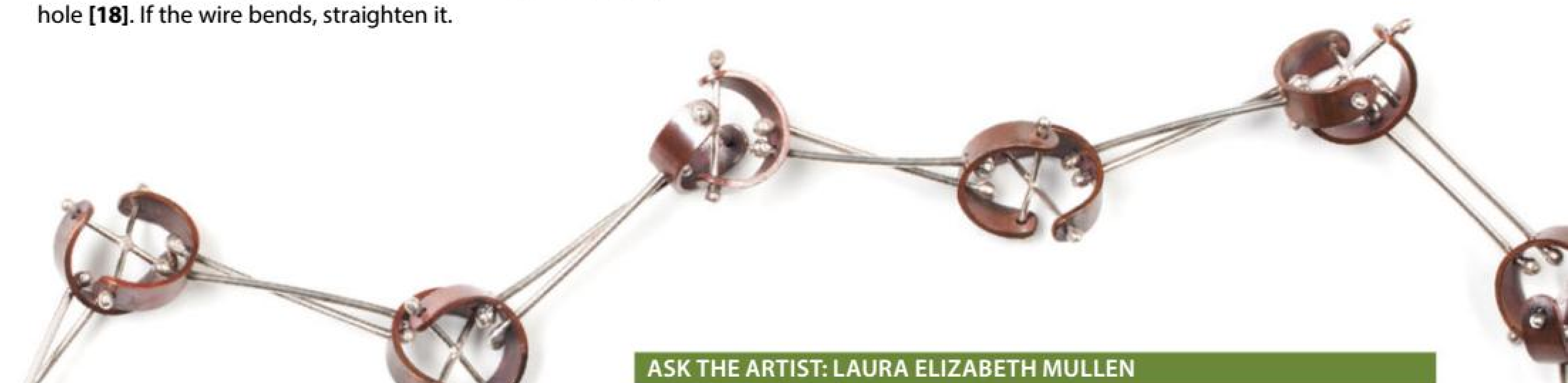
Connect a second link. Insert the two free legs of the same X connector into a semicircle strip of a second link **[20]**. Ball up both ends of the X connector **[21]**.

Connect the remaining links. Repeat to connect all of the links. Pickle the chain, and finish it as desired.



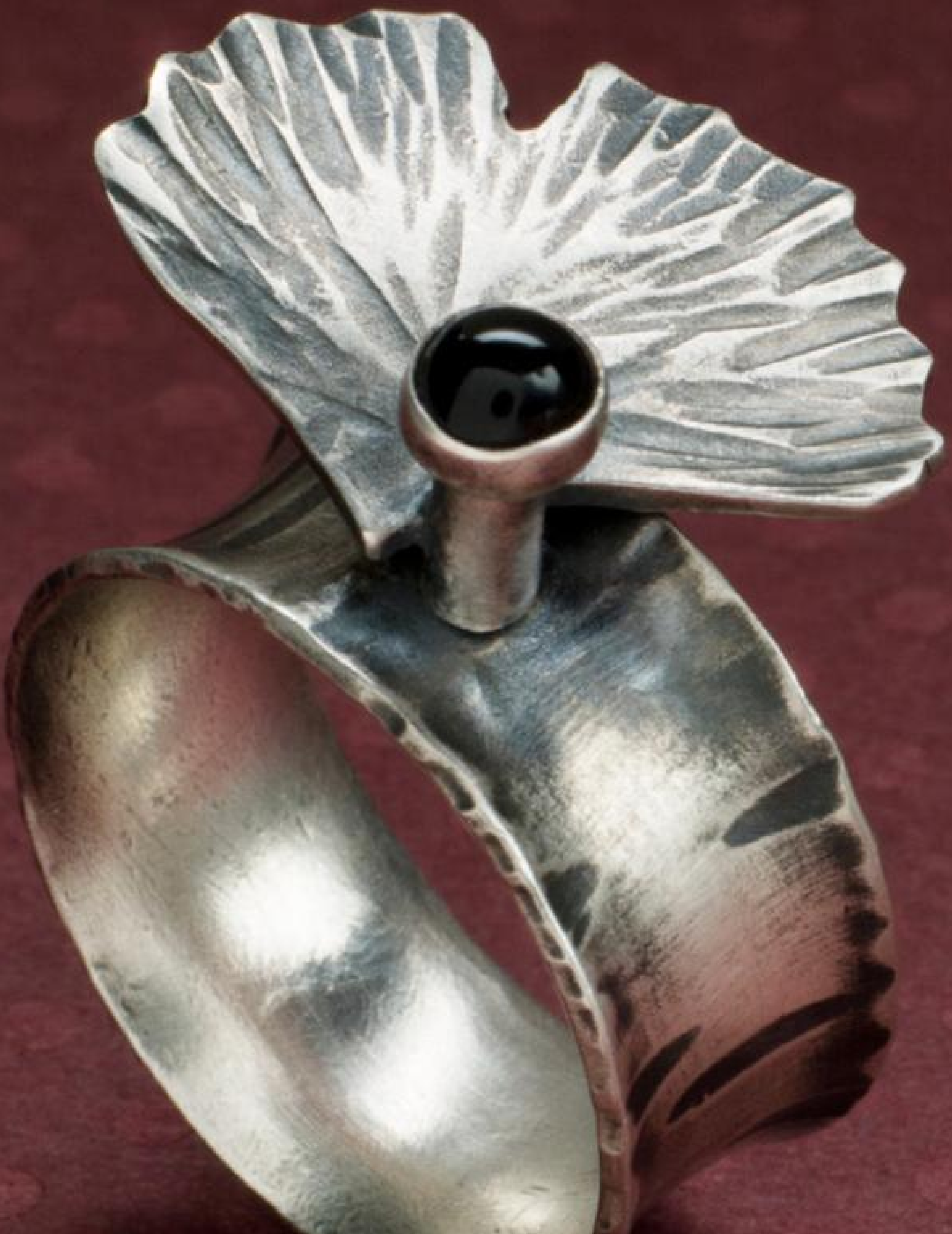
Although it looks complicated, this chain (shown here actual size) requires only simple fabrication techniques.

ASK THE ARTIST: LAURA ELIZABETH MULLEN

What's on your workbench right now?

"The working mechanism of a ratcheting mechanism. I am starting a body of work that will consist of 50 mechanical movements. They will be small wall sculptures made with the traditional tools and materials of a jeweler/metalsmith and evoke interaction because viewers will be able to push levers and handles to make the mechanical elements move."

Contact: www.lauraelizabethmullen.com



Make a Ring that SWINGS

A tube and a hidden post are the secret to creating a piece of jewelry that only sits still when you do.

by Julie Sanford

Add a "twist" to a silver and gemstone ring by adding a fun, kinetic mechanism! The forged and fabricated gingko leaf, powered by the movement of your hand, actually spins around the center stone of this playful ring. It is sure to surprise your friends and provide you with hours of delighted distraction.

materials

- Sterling silver sheet:
  - 18 gauge (1.0 mm): 64 x 10 mm (2½ in. x 25⁄64 in.)
  - 20 gauge (0.8 mm): 25.5 x 19 mm (1 x ¾ in.)
- Sterling silver wire: 14 gauge (1.6 mm), ½ in. (13 mm)
- Sterling silver tubing: 2.6 mm outside diameter (OD), 0.25 mm-thick wall, 5 mm (3⁄16 in.)
- Silver (sterling or fine) bezel cup, 4 mm
- Gemstone cabochon, 4 mm

toolboxes, *page 76*

- Sawing/Piercing
- Hammering
- Soldering
- Finishing

additional tools & supplies

- Flush cutters
- Wooden and metal ring mandrels
- Large metal ball punch
- Burnisher, bezel pusher, or round stone-setting punches

Find out where to buy supplies, *page 79*
See Safety Basics, *page 76*

BASICS & VIDEOS

Learn fundamental techniques in these bonus tutorials:	B	🎥	
Basic sawing of metal	●		Art+
Hammer textures	●	●	
Forging: How to use ball-peen and cross-peen hammers			Art+
Soldering	●	●	
Drilling through metal	●		Art+
Bezel-setting cabochons	●	●	

B Basics, *page 73*
🎥 Videos, www.artjewelrymag.com/videos
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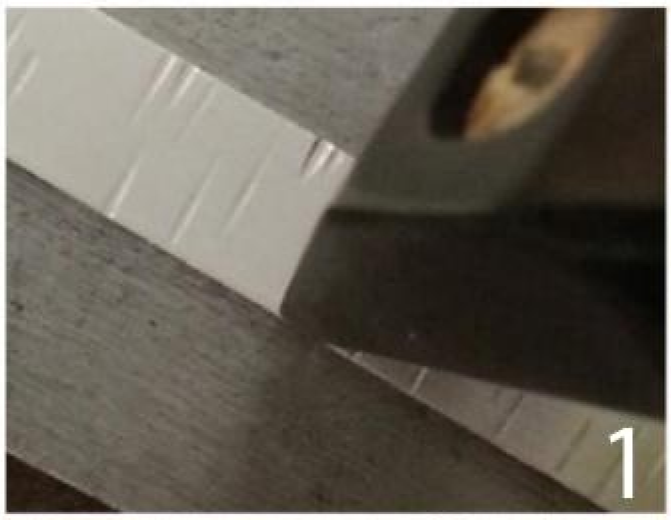
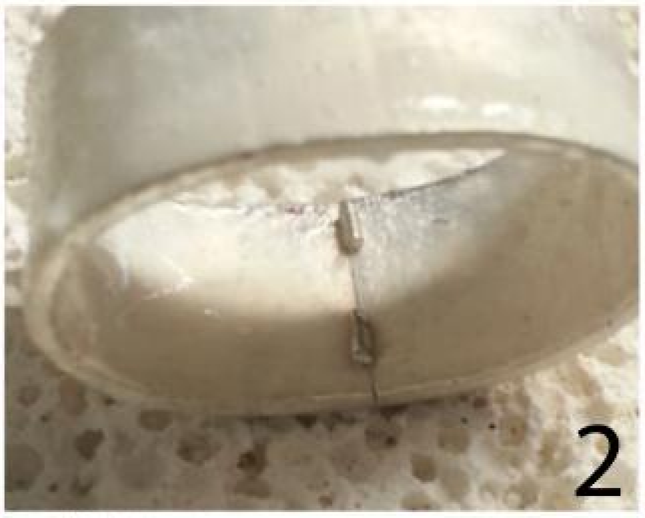
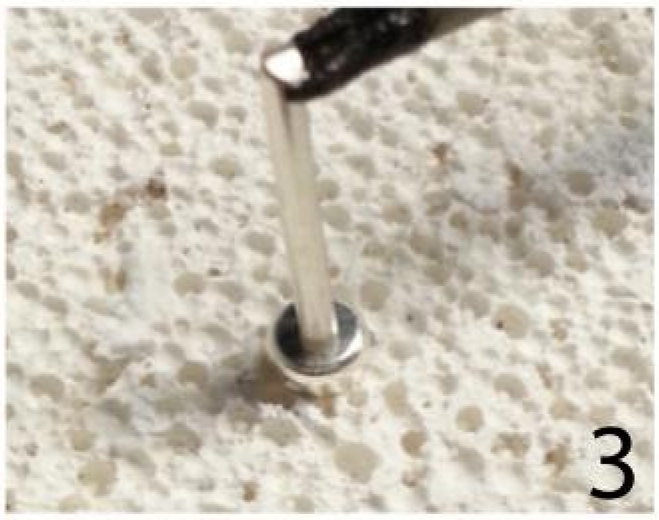
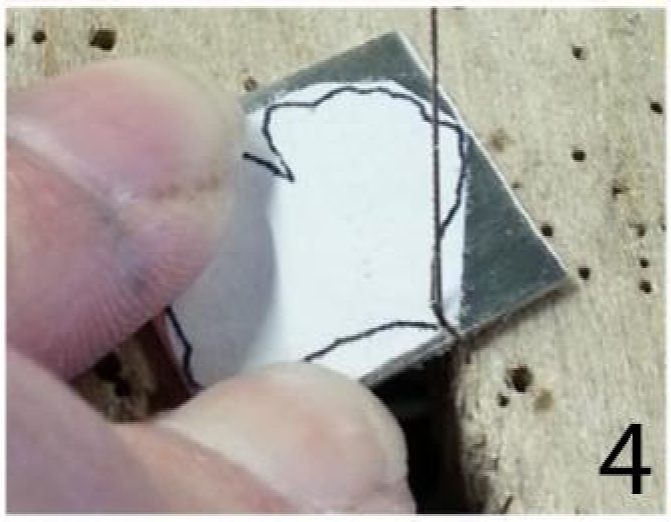
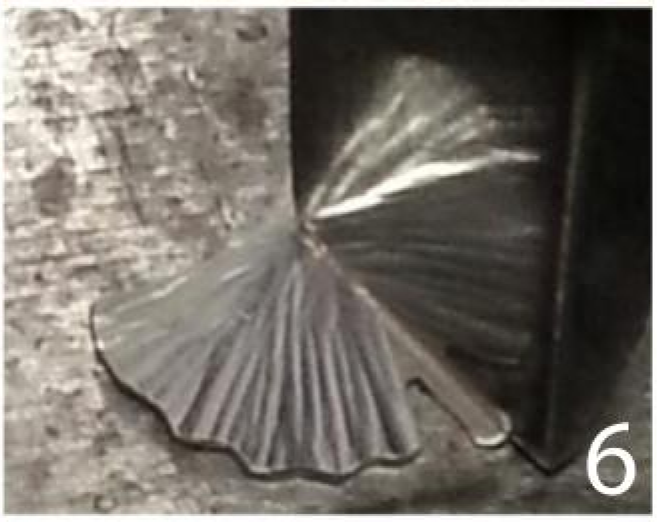










This kinetic ring can be broken down into three main parts: the ring, the center post, and the tube section. The main components are fabricated independently and then assembled to create the final ring. You can make them in any order.

Cut the ring blank. Use a bench shear or a jewelers saw with a 3/0 blade to cut a strip of 18-gauge (1.0 mm) sterling silver sheet to your desired length and width. My strip is 10 mm (slightly over ⅜ in.) wide. The length is determined by the size of ring you want to make.

> **TIP:** A quick way to determine the length of your ring blank is to measure the circumference of your ring size on a ring-sizing stick, and add that measurement to 3x the metal thickness.

If your strip isn't flat (a natural side effect of using a shear), place it on a steel bench block and use a mallet to flatten it.

If desired, apply texture to the ring blank. I used the cross-peen face of a goldsmiths hammer to give my band a random, linear texture **[1]**. Of course, you can apply any texture you wish.

Solder the ring. Clean the ring blank with emery paper, and then sand and file the ends of the blank. Use a rawhide mallet to form the blank around a ring mandrel until the ends meet. If there are any gaps, file and sand as needed until the ends of the blank meet flush.

Set the ring band on your soldering surface, apply flux to the entire surface of the ring, and lay pallions of hard solder along the join **[2]**. Use your torch to heat the entire ring; once the flux is dry, concentrate the flame near the join. Use the heat of the torch to draw the solder along the length of the join. Then quench, pickle, and rinse the ring band.

When the band is dry, use the cross-peen hammer to upset the edges, if you desire. Place the band back on the ring mandrel and use the mallet to form it into a perfect circle. Set the band aside.

Make the center post. Use flush cutters to cut a 13 mm (½-in.) length of 14-gauge (1.6 mm) sterling silver wire. File one end of the wire flat.

Place a 4 mm silver (fine or sterling) bezel cup face-down on your soldering surface. Check the wire against the back of the cup to make sure it meets flush **[3]**. Paint flux onto the back of the cup and the flat end of the wire. Use cross-locking tweezers to hold the wire down on the center of the cup, and use hard solder to solder the wire to the cup. Quench, pickle, rinse, and dry the center post.

Make the embellishment. For my embellishment, I used a hand-drawn gingko leaf template — you can create a similar leaf, or draw or choose your own design.

Use rubber cement to attach the template to a sheet of 20-gauge (0.8 mm) sterling silver. Use a jewelers saw with a 3/0 blade to cut out the leaf **[4]**. Remove the template, then file and sand the edges of the leaf to remove any burrs or sharp edges **[5]**.

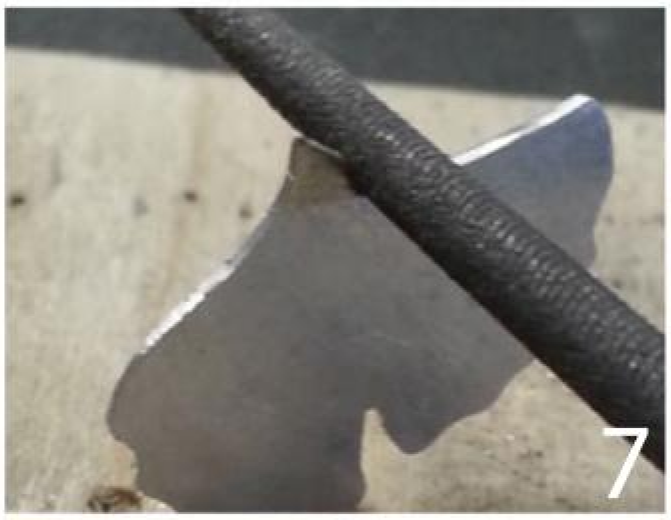
Place the leaf on a steel bench block and forge it with a small cross-peen hammer **[6]** to give it a leaflike texture.

NOTE: I keep my hammer horizontal at the 3 o'clock position and alternate rotating the leaf clockwise and counterclockwise while striking the metal. After two or three rotations, the leaf has a natural-looking texture.

Make the tube section. Cut a 5 mm (3⁄16-in.) piece of 2.6 mm outside-diameter (OD) sterling silver tubing with 0.25 mm-

See a two-part demo on making a simple band ring at **www.artjewelrymag.com/videos**.

Check out four ways to cut metal tubing in our FREE online reference guide at **www.artjewelry.mag.com**.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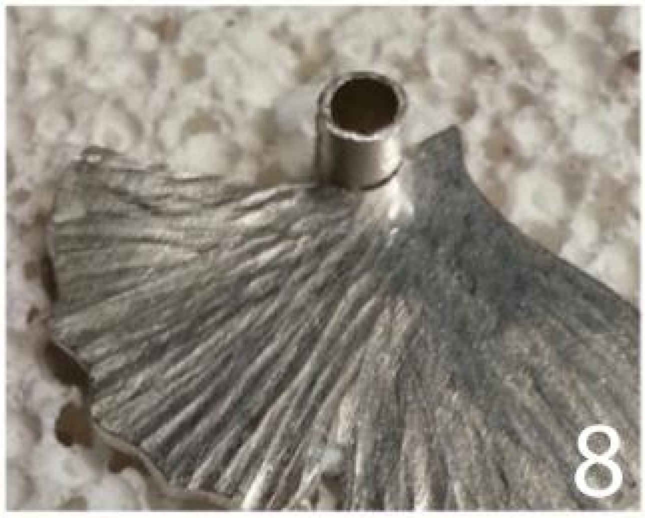
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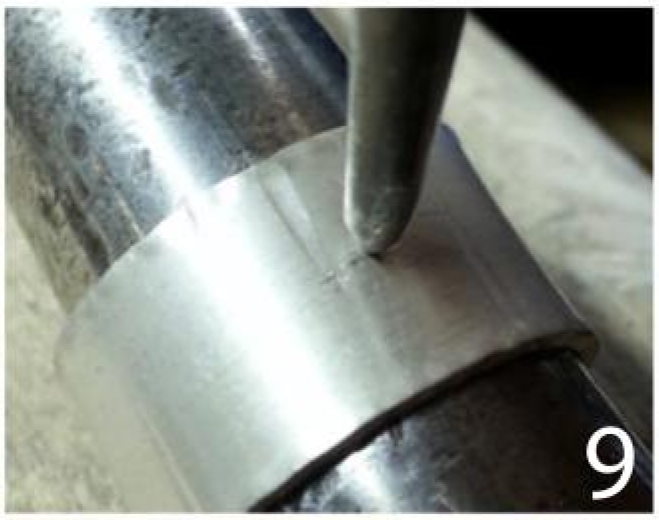
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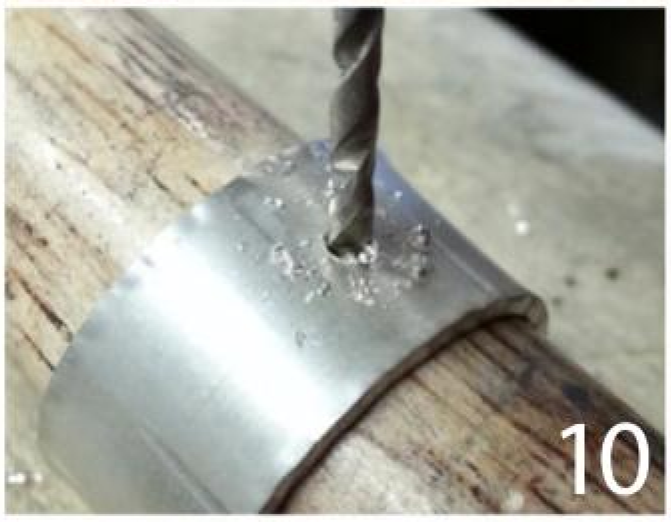
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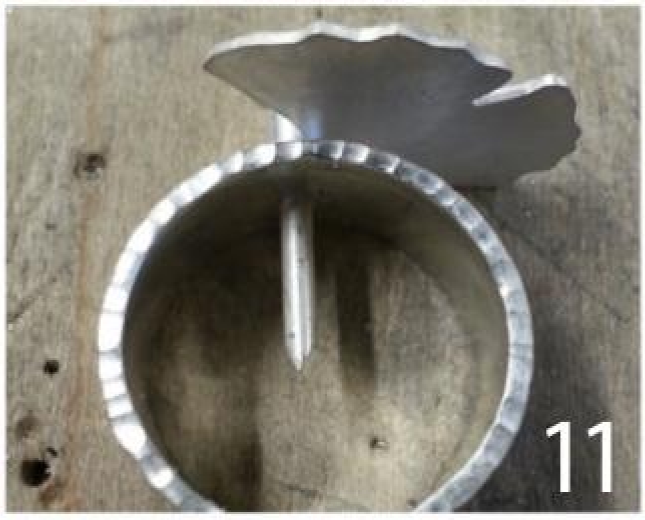
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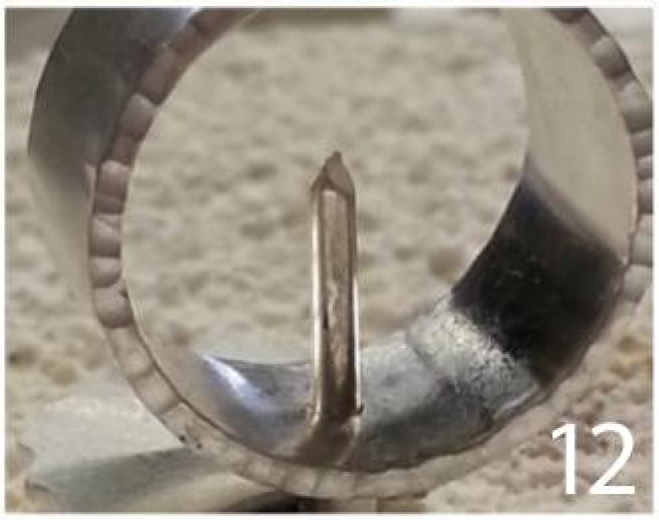
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thick walls. File the ends of the tube flat.

Use a round needle file to create a notch in one edge of the leaf **[7]**. While filing, periodically stop and check the fit of the tube in the notch; it should fit flush.

Solder the leaf in place about midway on the tube. To set this up, push the tube halfway into your soldering surface, and lay the leaf on the surface against the tube **[8]**. Use hard solder to join the tube and leaf, then quench, pickle, rinse, and dry the tube section.

Assemble the ring. Find the center on the top of the ring band (the solder seam is at the bottom). Use a scribe or a fine-tip permanent marker to mark that spot, and then put the ring band on the metal ring mandrel. Use a center punch to make a divot at the mark **[9]**.

Move the ring band to a wooden mandrel or secure it in a ring clamp, and use a #53 (1⁄16-in./1.5 mm) drill bit in a flex shaft or rotary tool to drill a hole at the divot **[10]**. (Make sure the bit goes in perpendicular to the band!)

NOTE: To ensure a good join, the post should fit tightly in the hole. I like to drill the hole slightly smaller than the post wire, and then use the round needle file to ream it a little at a time until the wire just barely fits.

Slide the wire of the center post down through the tube, and then through the hole in the top of the ring band **[11]**.

Solder the ring assembly. The objective in this step is to solder the center post to the ring *without* soldering the post to the tube. Also, any solder on the top surface of the ring will either interfere with the smooth rotation of the tube on the post or — worst-case scenario — solder the tube to the ring, rendering it immobile.

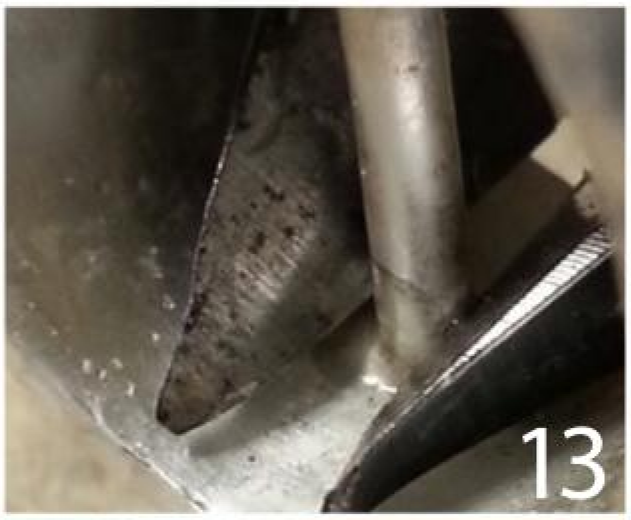
To be successful, you have to solder the post from the inside of the ring. You can also mask the tube and the top of the ring with antiflux (yellow ochre is a common antiflux) and hold the tube with cross-locking tweezers while you solder. (The tweezers will create a heat sink on the tube and prevent it from heating at the same rate as the ring.)

The assembly holds together better

tool spotlight: stone-setting punch

This type of stone-setting system is best for setting small faceted stones and cabochons in bezels and tube settings. Each set contains a variety of punches with concave faces. Like any punch, imperfections on the surface will transfer to your bezel, so polish the concave surfaces to a mirror finish before using them.

Place your cabochon into a prepared bezel (or cut a level seat in a piece of tubing for a faceted stone so that the table of the stone is ever-so-slightly above the top of the tube). Make sure the bezel is fully supported (for this project, place the ring on a steel ring mandrel). Choose a punch with a concave end that is slightly larger than your bezel (make sure the top edge of the bezel is completely covered), and insert it into the wooden handle. Place the punch vertically over the bezel, and press down firmly and rotate the punch to begin to burnish the bezel over the stone. Remove the punch from the handle, place the punch back over the setting, and use a chasing hammer to tap the punch — don't hit it too hard, or you may crack your stone. Check the setting, make adjustments, and continue until the bezel is flush against the stone.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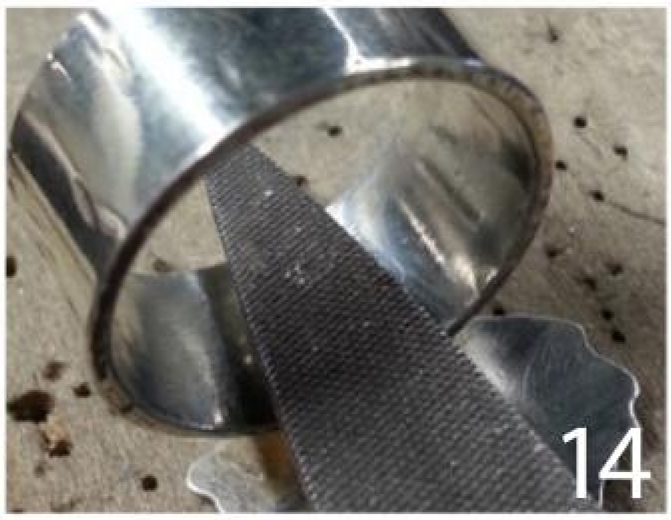
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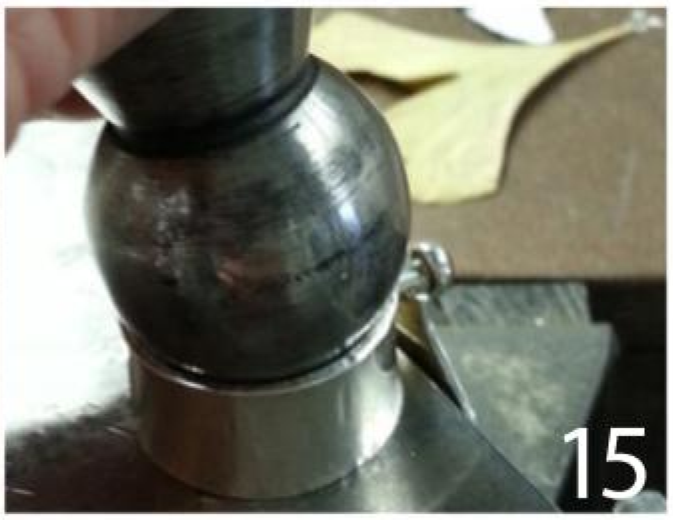
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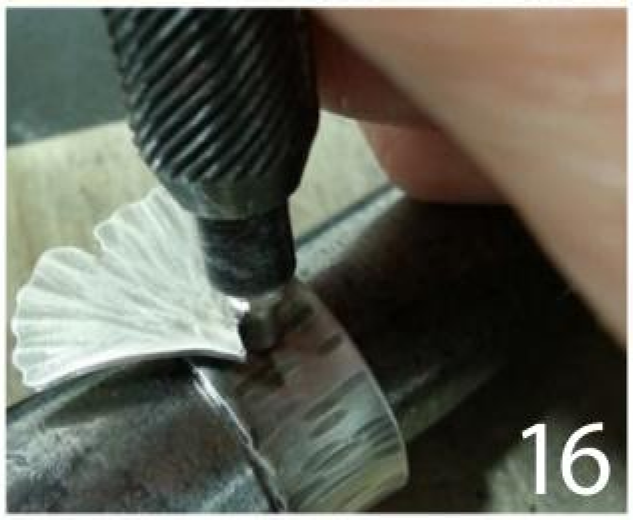

16

during the soldering process when it's upside down **[12]**. There are a couple of ways of propping up the ring assembly that work well. You can push the bezel into the brick and steady the band with a third hand. Or, you can support the piece in an annealing pan with pumice.

Use easy solder to solder the post to the inside of the ring; remove the heat as soon as the solder flows into the join. Quench, pickle, rinse, and dry the ring.

Finish the ring. Use flush cutters to cut the post flush with the inside of the ring **[13]**, then file it smooth **[14]**.

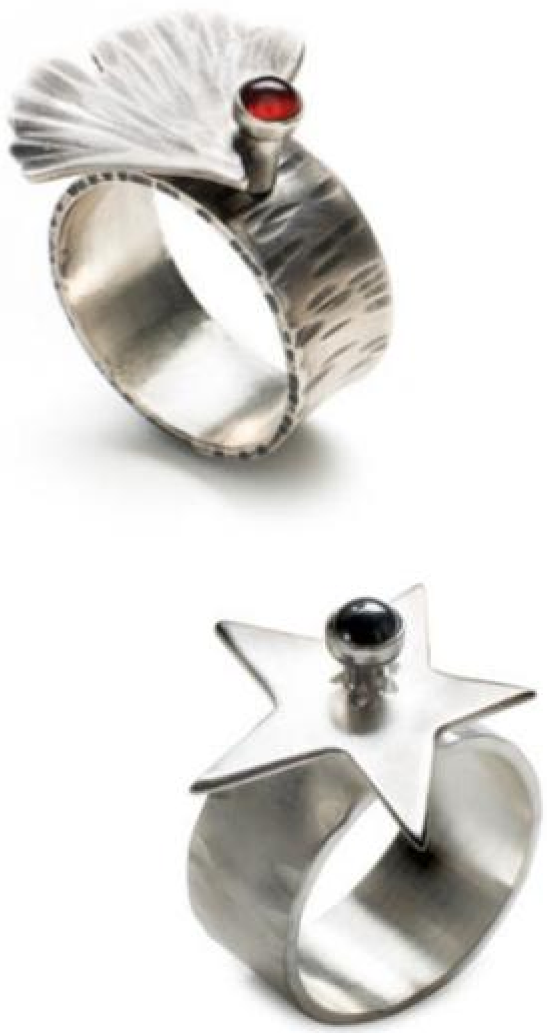
Use finishing techniques, including wire brushing, sanding, patinating, and/or polishing, to finish your ring as you desire.

Test the ring's "spin." The spinning action is usually stiff at first; using slight pressure, hand-twist the tube back and forth several times to help burnish the metal where the tube meets the ring. Flick it to see if it moves well on its own.

Set the ring on a steel bench block and use a large ball punch to slightly flare the ring **[15]**. Turn the ring over and repeat to flare the other side. This creates a nice contour and will help make a wide-band ring fit more comfortably on the finger.

Set the stone. Place a 4 mm cabochon in the bezel, and set the stone. You can use a burnisher or bezel pusher for this, but I prefer to use a setting punch for such small stones (see "Tool Spotlight: Stone-Setting Punch," *page 39*) **[16]**. Be careful, though; remember that the bezel is supported by the center post. Use too much pressure to set the stone, and you might bend the post.

Once you have completed this ring and learned to create the mechanism, you can begin designing other kinetic ring styles. Try altering the ring band, spinning embellishment, the top of the ring, and/or the metals used. My first kinetic piece was an amethyst ring with a rotating pearl. What can you imagine?



Your embellishment can be any size or shape you wish. Draw your own — as Sanford did with her gingko leaf — or use a copyright-free design, like the star.

ASK THE ARTIST: JULIE SANFORD

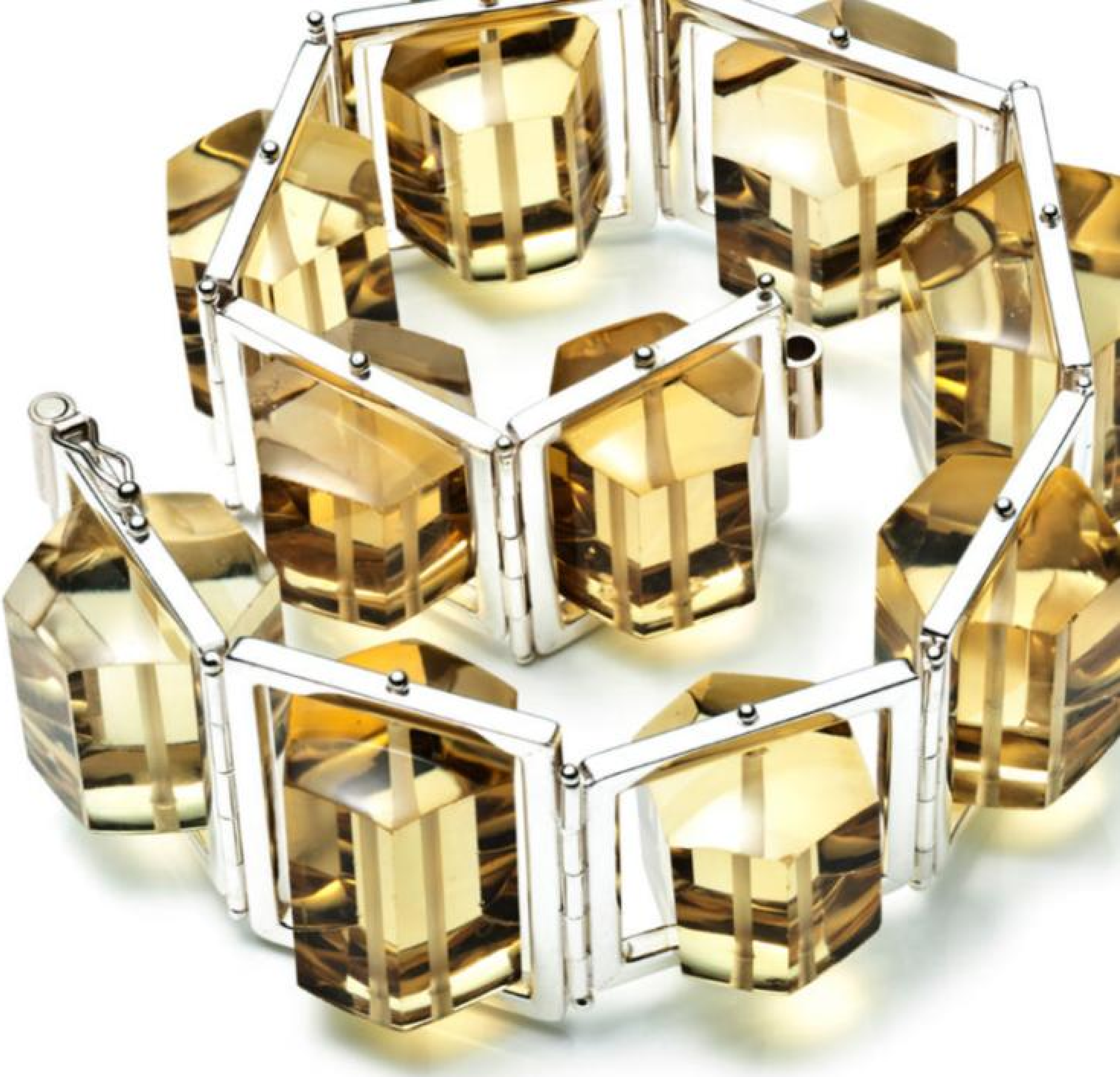
What is sitting on your bench right now?

"I have an exciting new project in process. I'm working on part of a collaborative installation for ArtPrize 2015, an internationally recognized, city-wide art competition in Grand Rapids, Mich. My part of the project, titled *Feast–7 Hungry Artists*, is a sterling silver flatware service for eight. I've got the drawings done and can't wait to get the pieces going! For more information on the project, visit www.artprize.org/7-hungry-artists/2015/feast."
Contact: www.juliesanforddesigns.com.

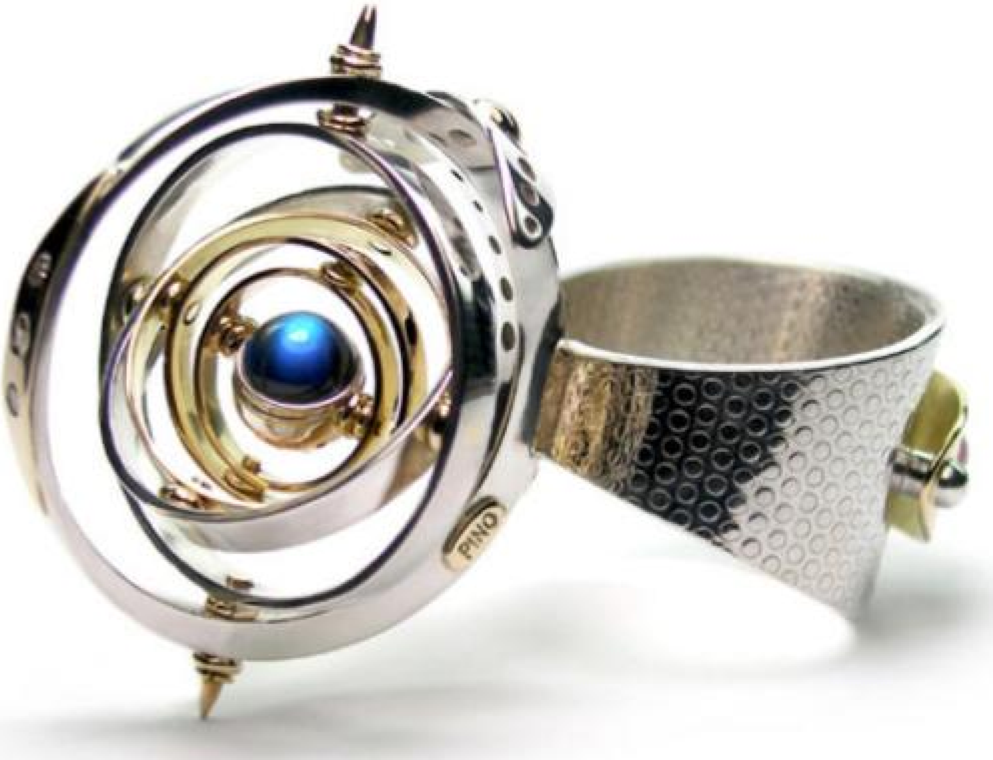
Find the measurements of U.S. and U.K. ring sizes, and learn to calculate the length of metal sheet you'll need for a ring band. Get the free PDF at **www.artjewelrymag.com/reference**.

Jewelry that MOVES!

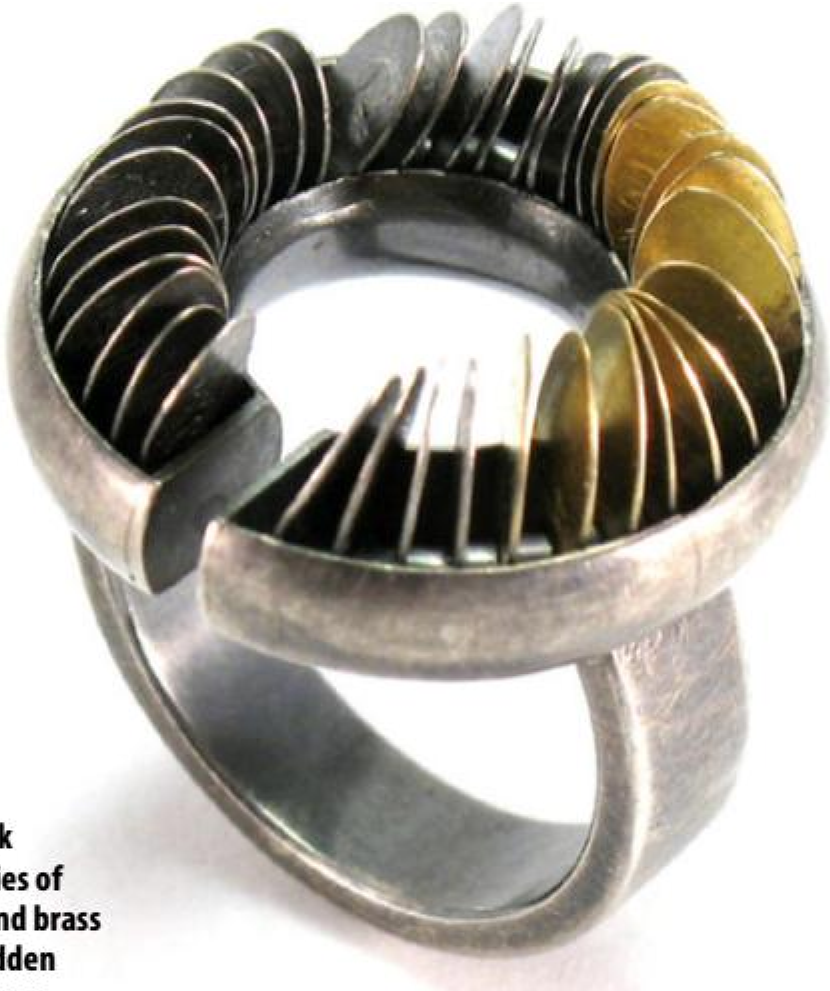
Given that the modern world becomes more frenetic and fast-paced every day, it's small wonder that jewelry that moves has become more popular than ever. Some pieces ripple and sway along with the motion of the wearer; others require intentional interaction to make them move. But it's not just about energy — nervous or otherwise. There's a flexibility to the idea of kinetic jewelry, a rejection of stasis, and a determination to never be just one thing. AJ



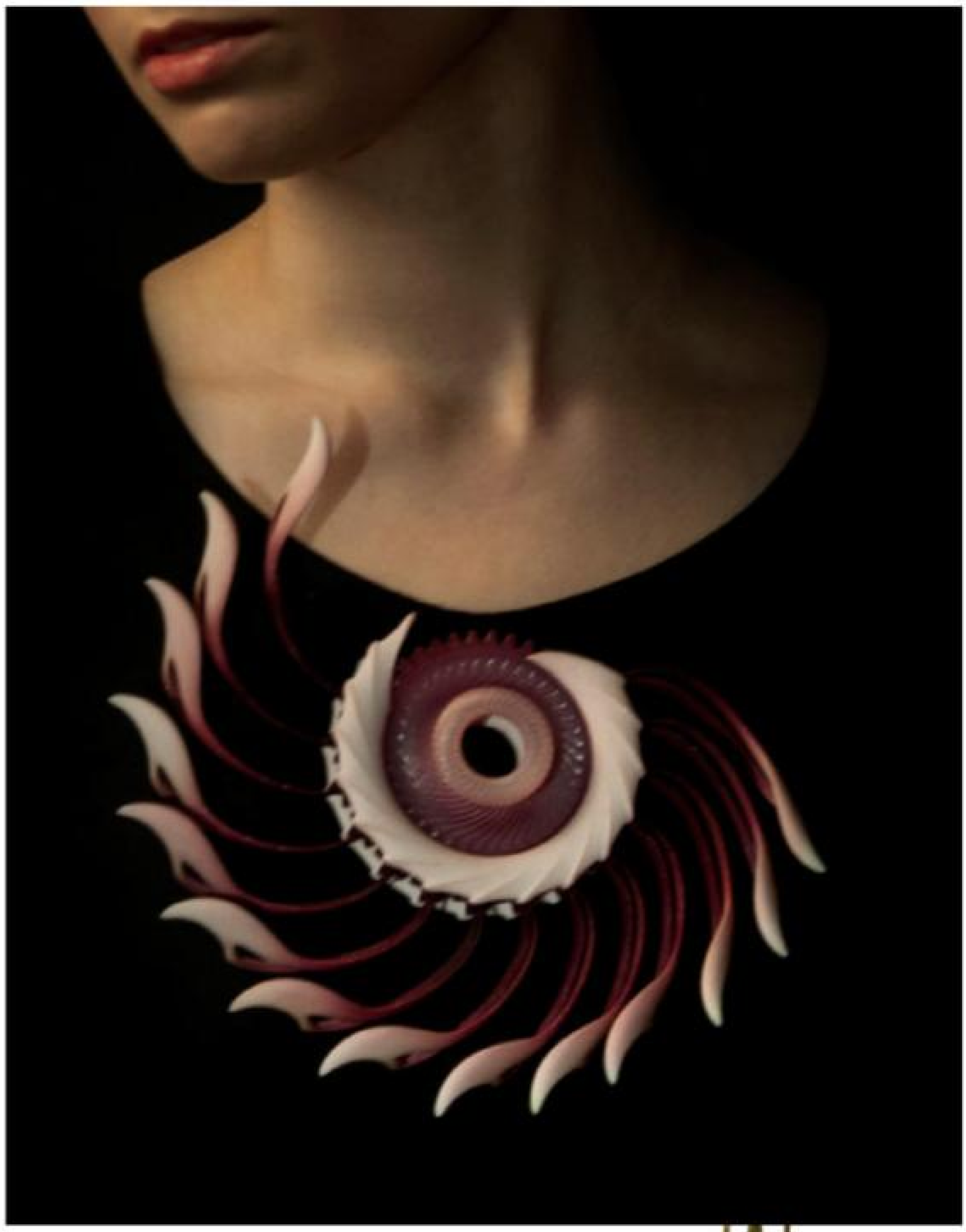
▲ **Elegant yet playful, simple yet full of motion, Patricia Madeja's pieces are inspired by geometric forms and architectural structures. In *Sunburst Bracelet*, she suspends citrine crystals within sterling silver frames set off with a 14k-gold clasp. www.patriciamadeja.com.** Photo by Kronus Photo.



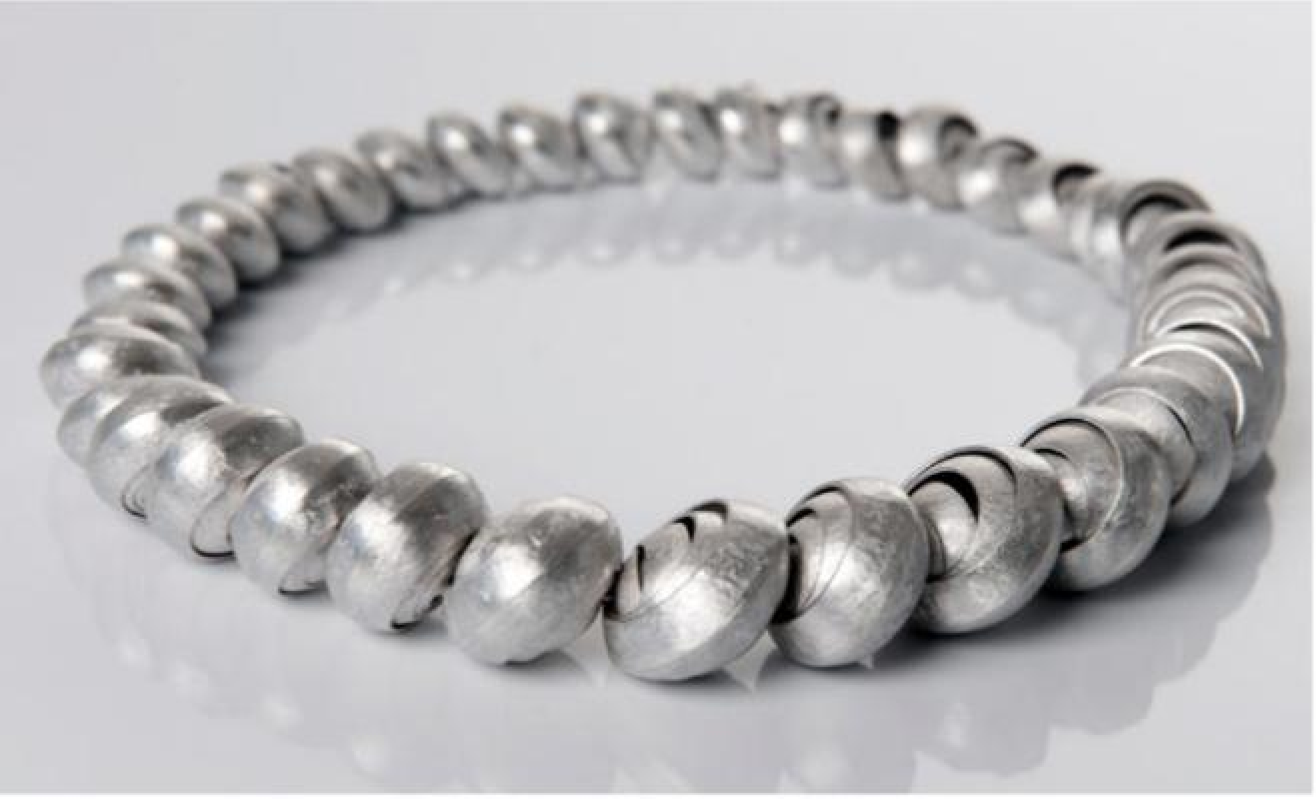
▲ **Canadian artist Claudio Pino was originally spurred to create kinetic pieces by a stone that he wanted to show off in various lights. In this *Infinity* ring, he has placed a blue moonstone in the focal spot, surrounding it with sterling silver, 14k gold, diamonds, and citrine to explore the concept of weightlessness; the stone represents a drop of water floating freely in space. www.pinodesign.net.**
Photo by the artist.



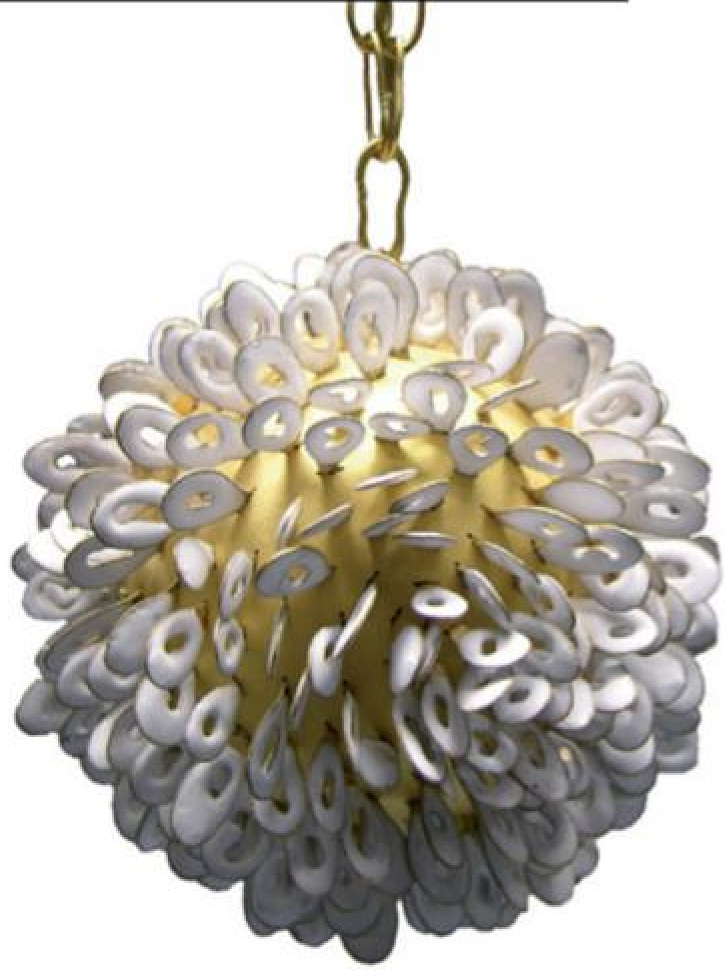
► **Joanna Gollberg broke from her well-known work featuring multiple bright gemstones to create a series of playful, metal-only rings and pendants. The silver and brass disks in this sterling silver ring are threaded on a hidden rung, allowing them to slide. www.joannagollberg.com.**
Photo by the artist.



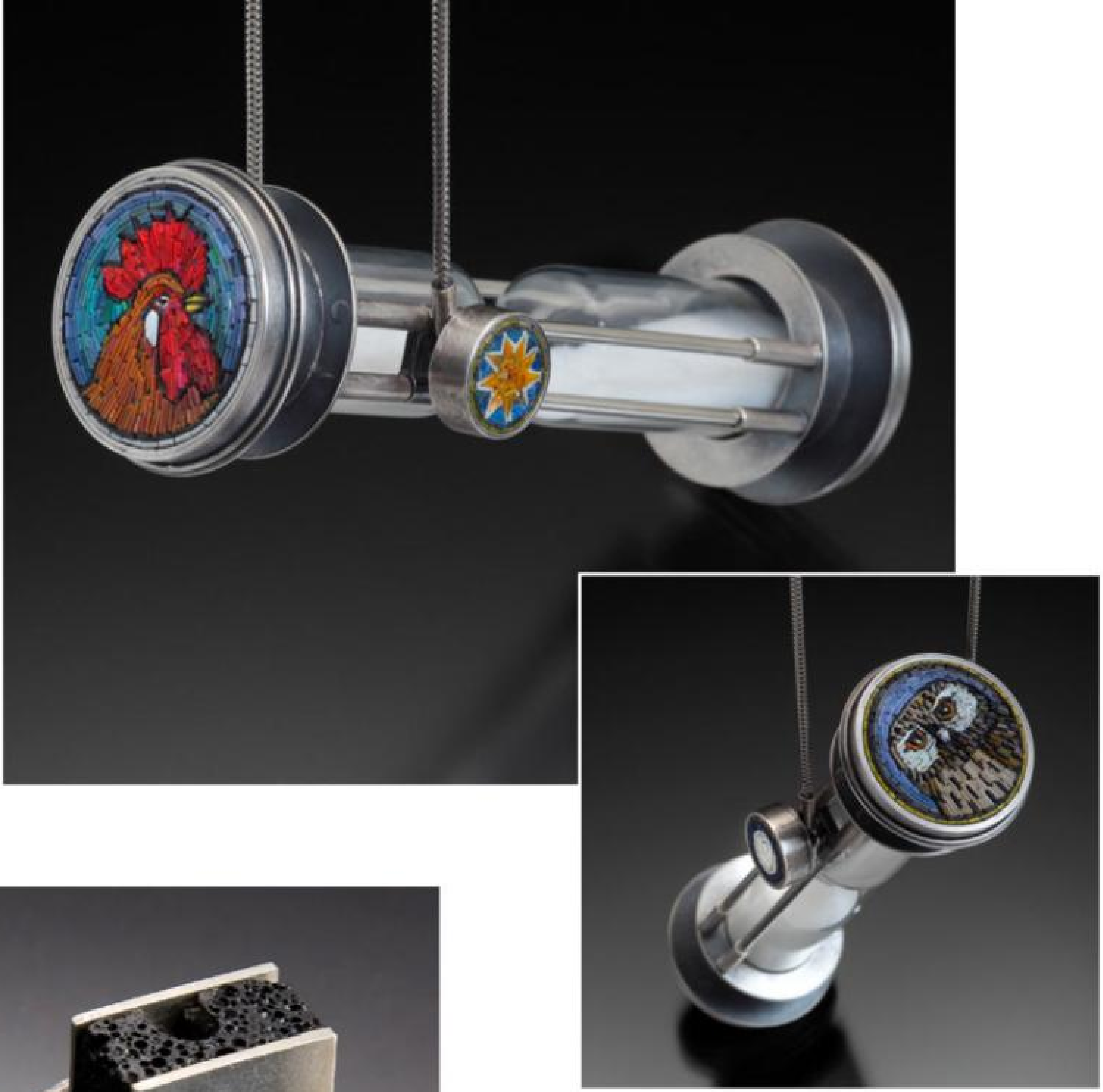
Rachel Fine is fascinated by the ways different animals show fear, surprise, or anxiety, and by how humans have lost those physical signifiers. She highlights the more subtle reactions of humans by using materials that are highly responsive to movement. *Breathing Brooch*, of nylon and photopolymer. www.cargocollective.com/rachelfine.



▲ Swiss artist Gundula Papesch works in sterling silver; the links in this necklace are nested layers of silver, which allow the components to swivel and rotate while worn. www.gundulapapesch.com. Photo by Graziella Antonini.

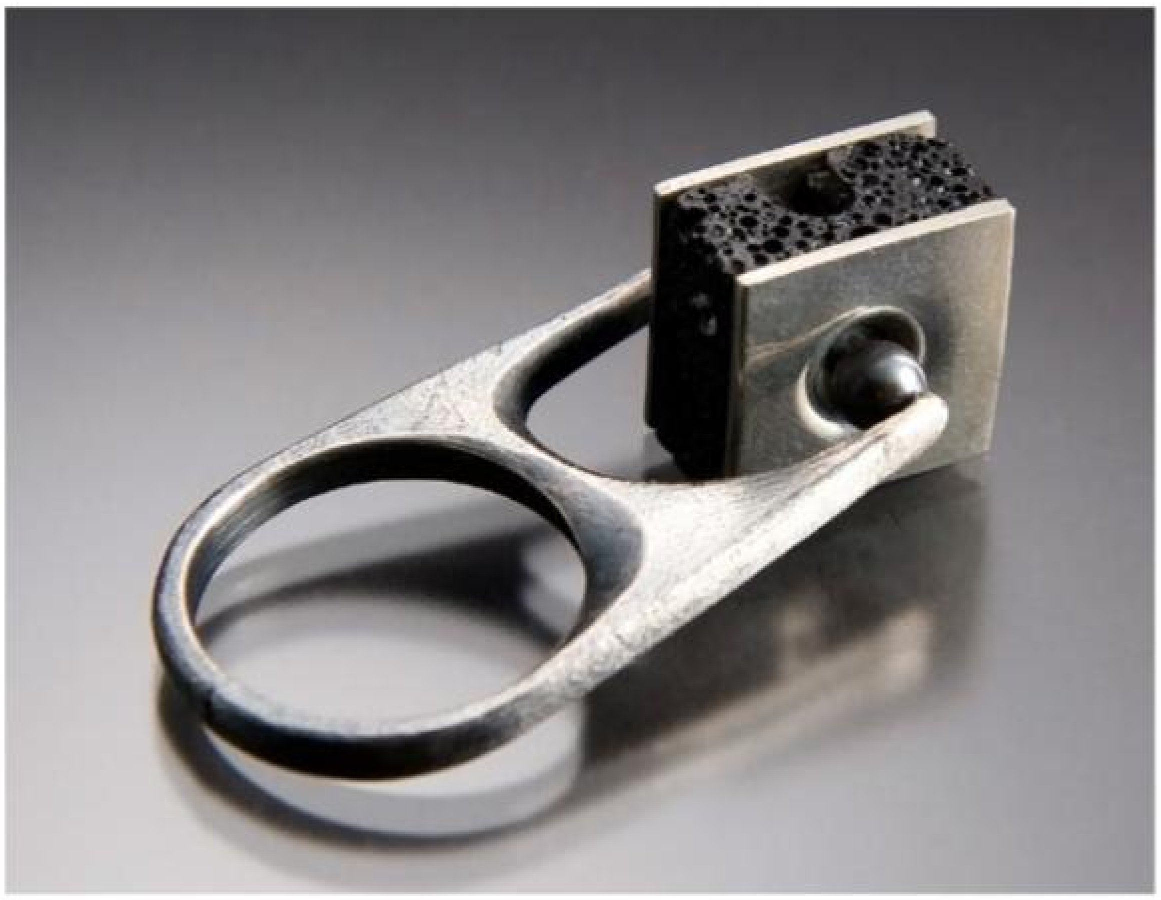


▲ Jacqueline Ryan (who also created our cover piece), studded a base of 18k gold with moveable elements coated in vitreous enamel, then strung the pendant on a hand-forged chain. www.jacqueline-ryan.com/jewellery.
Photo by the artist.



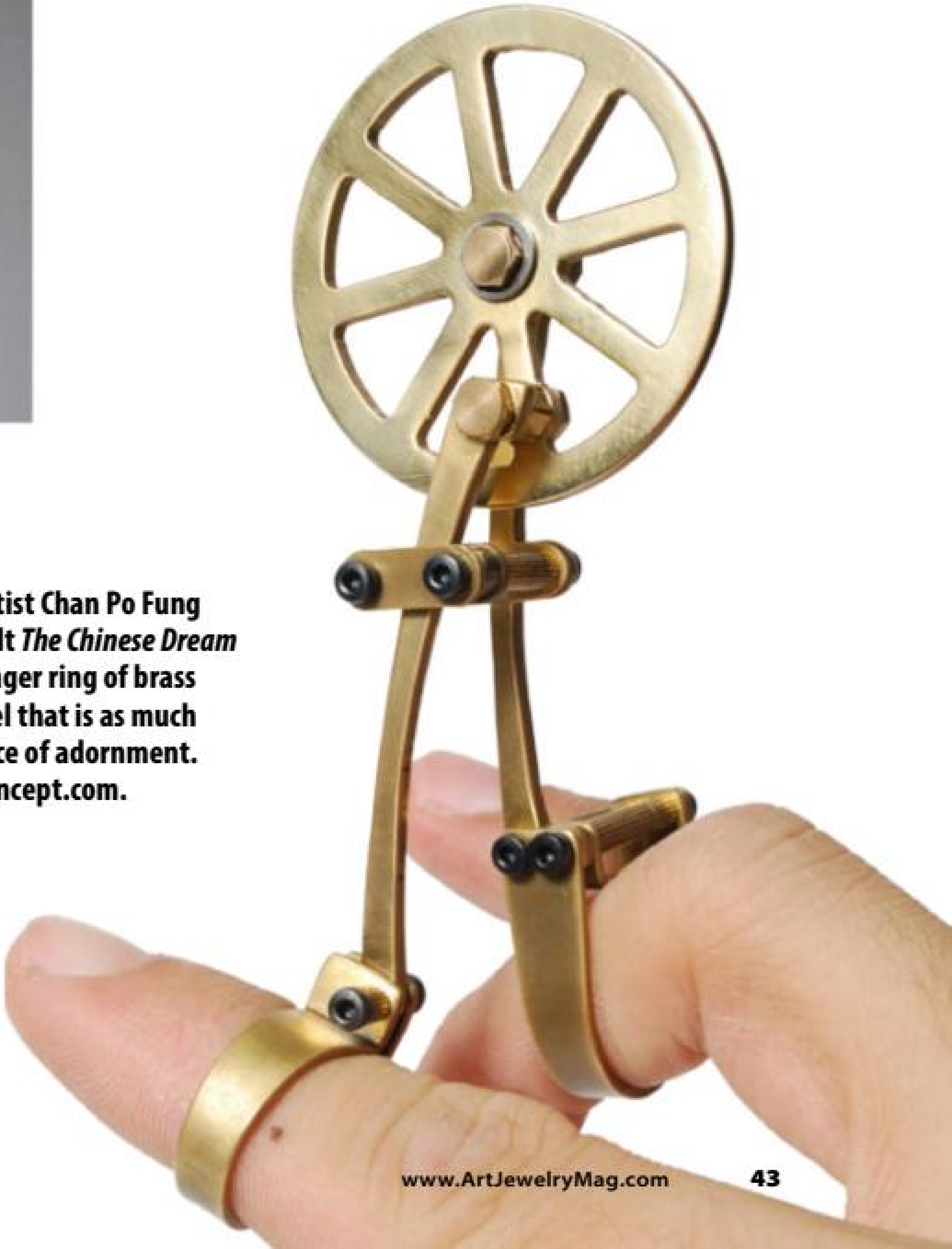
▶ Cynthia Toops and Chuck Domitrovich collaborated on this *Break of Day, Heart of Night Hourglass* pendant. Domitrovich fabricated the sterling silver framework; Toops the polymer micromosaics that represent the night owl on one end, the cock that crows at dawn at the other, and the sun and moon on the sliding component. Toops: www.cdbeads.biz; Domitrovich: www.etsy.com/people/downtothewiredesigns.

Photos by Doug Yaple.

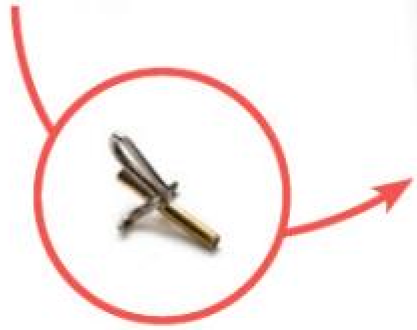


▲ For Aleksandra Vali, much of the appeal of her *Chocolate Dessert* rotating ring, of sterling silver, Greek lava, and Akoya pearls, is how vastly disparate materials work together and against each other. The central lava element turns freely on its axis. www.aleksandravali.com.

Photo by the artist.



▶ Hong Kong artist Chan Po Fung designed and built *The Chinese Dream of Train*, a two-finger ring of brass and stainless steel that is as much a toy as it is a piece of adornment. www.playbackconcept.com.



materials

- Brass or silver tubing: snug fit on your pin stem, amount determined by design
- Wire:
  - 18-gauge (1.0 mm), amount determined by design
  - 20-gauge (0.8 mm), amount determined by design (optional)

- toolboxes, page 76
- Sawing/Piercing
- Wirework
- Soldering/Annealing

additional tools & supplies

- Tube-cutting jig (optional)
- Fine-tip permanent marker

Find out where to buy supplies, *page 79*
See Safety Basics, *page 76*

BASICS & VIDEOS

Learn fundamental techniques in these bonus tutorials:	B	Videos	Art+
Basic sawing of metal	●	●	Art+
How to file		●	
Coiling wire		●	Art+
Sanding	●		
Soldering	●		
Pickle basics	●	●	
Cutting jump rings with a jeweler's saw	●	●	Art+
Opening and closing a jump ring	●	●	

B Basics, *page 73*
Videos, www.artjewelrymag.com/videos
Art+ Subscriber videos, www.artjewelrymag.com/subvideos

Design 3 Custom PIN-TO-PENDANT CONVERTERS

Add flexibility to your jewelry pieces with a simple finding that quickly transforms any brooch into a pendant.

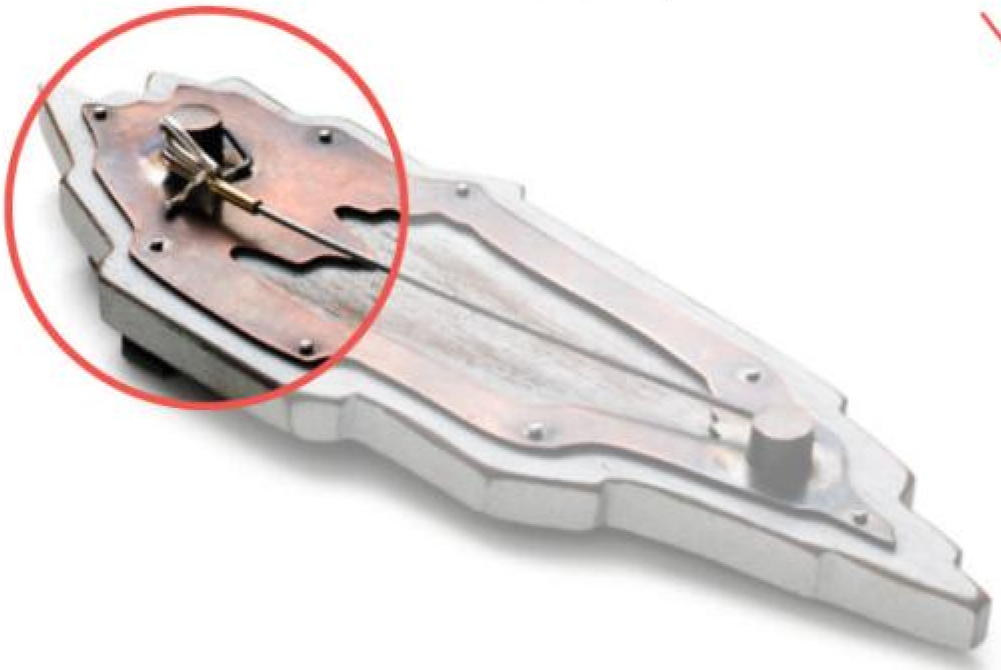
by Tova Lund

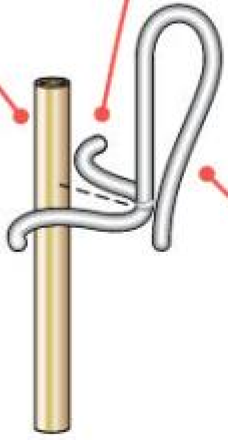
Pin-to-pendant converters are an easy, functional way to add versatility to your jewelry collection. Slide them right onto a pin back, and with the addition of a custom or ready-made chain, you get instant double duty out of your jewelry! Commercially made converters can be purchased, but they are often not the correct size, leaving the brooch hanging crooked, or worse, shifting side-to-side while being worn, which could potentially scratch and harm your brooch. I will show you how to create quick and easy converters for both single and double pin stems that will suspend your piece at the right angle and hold it securely.

Discover a variety of ways to cut metal tubing at **www.artjewelrymag.com/reference**.

1 SINGLE PIN STEM: Vertical

1 **TUBE:** Cut a piece of tubing that fits snugly on your pin stem. The length doesn't matter (mine is about ½ in. [13 mm] long). File and sand the ends, then slide it onto the pin stem.





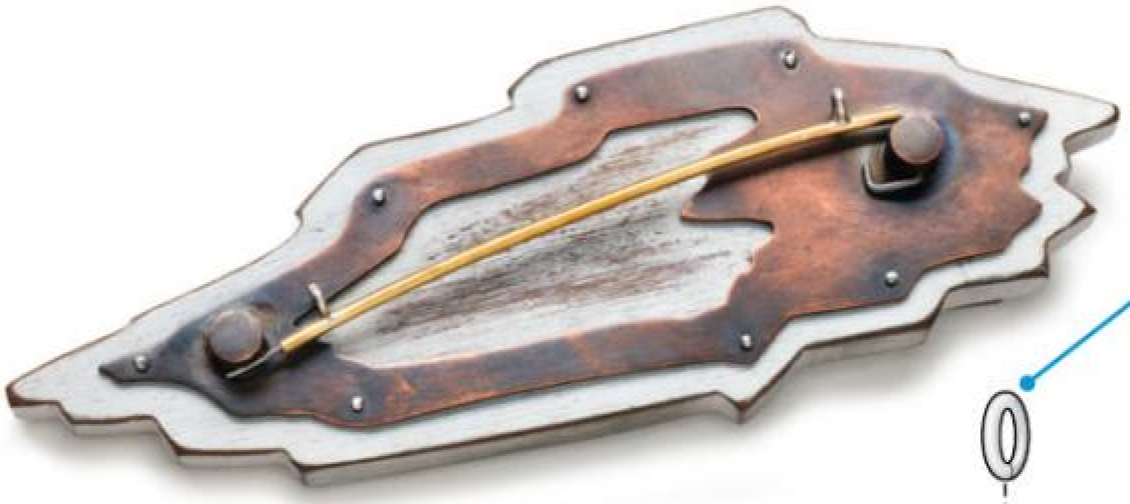
2 **BRACE:** Form a short piece of 18-gauge (1.0 mm) wire about halfway around the leftover long tubing. Make sure it's a tight fit. Use roundnose pliers to curl the wire "legs" upward, one at a time. Test the brace over the tube on the pin stem to make sure the curved "legs" rest on the back of the brooch. Mark the tube where the brace rests on it (it should be placed about one-third of the way down from the top of the tube). Use flush cutters to trim the "legs," and file and sand them.

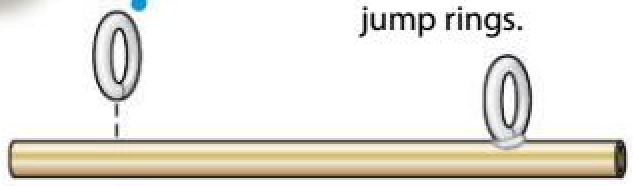
3 **BAIL:** Use roundnose pliers to make a U-shaped bend in a piece of 18-gauge (1.0 mm) wire (my wire was ¾ in. [19 mm] long). One leg of the U should be slightly longer than the other. File the short end flat, and the long end until it's rounded.

4 **ASSEMBLY:** Remove the tube from the pin stem, and use hard solder to solder the brace to the tube at the marked point. Make sure the brace is at the correct angle and location in relation to the tube as it was when the tube was on the pin stem.

Place the tube-and-brace assembly on a soldering board, and rest the bail on top of the tube so that the short end of the bail butts up against the top edge of the brace and the long end rests on top of it. Make adjustments to the bail as necessary. Use medium solder to attach the bail.

2 SINGLE PIN STEM: Horizontal



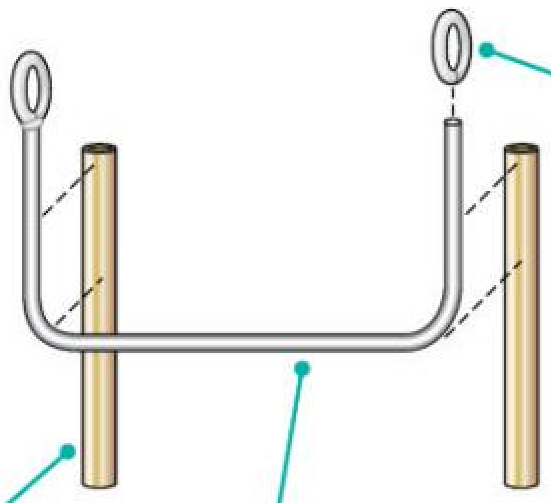


1 **TUBE:** Cut a piece of tubing the length of the pin stem between the hinge and the catch. This will prevent the brooch from sliding side-to-side on the converter. If necessary, use your fingers to make a slight curve in the tube to match the curve of the pin stem (don't bend it too much, or the tube will kink). Mark a spot near each end of the tube where you will attach the jump rings.

2 **JUMP RINGS:** Use 18- or 20-gauge (1.0 or 0.8 mm) wire to make two jump rings. (Mine have a ⅛-in. [3 mm] inside diameter; make sure yours are large enough for your chain to fit through.) Close the jump rings.

3 **ASSEMBLY:** Place the tube top-side up on a soldering board. Hold one jump ring in a pair of cross-locking tweezers with the join facing down. Gently heat the jump ring, and touch the join to a pallion of hard solder to pick it up. Hold the jump ring solder-side down on and perpendicular to the tube, and heat the assembly until the solder flows. Repeat for the second jump ring.

③ DOUBLE PIN STEM: Vertical

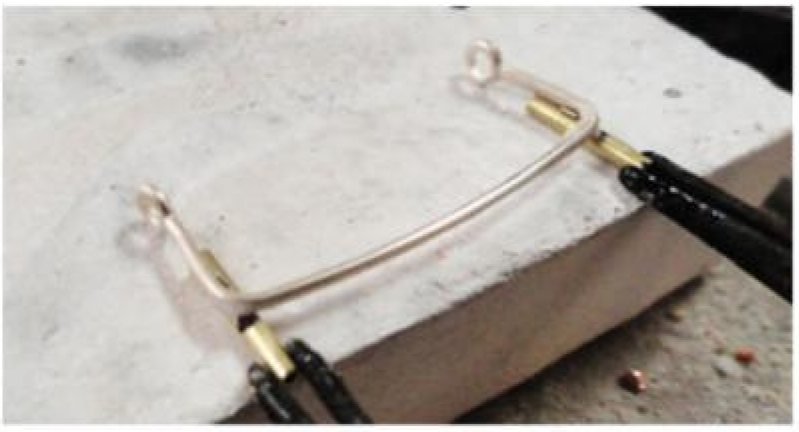


1 TUBES: Cut two pieces of tubing the same length (the longer they are, the more difficult it will be to slide the converter over the pin stems). File and sand the ends, and then slide them onto the pin stems as far as they can go.

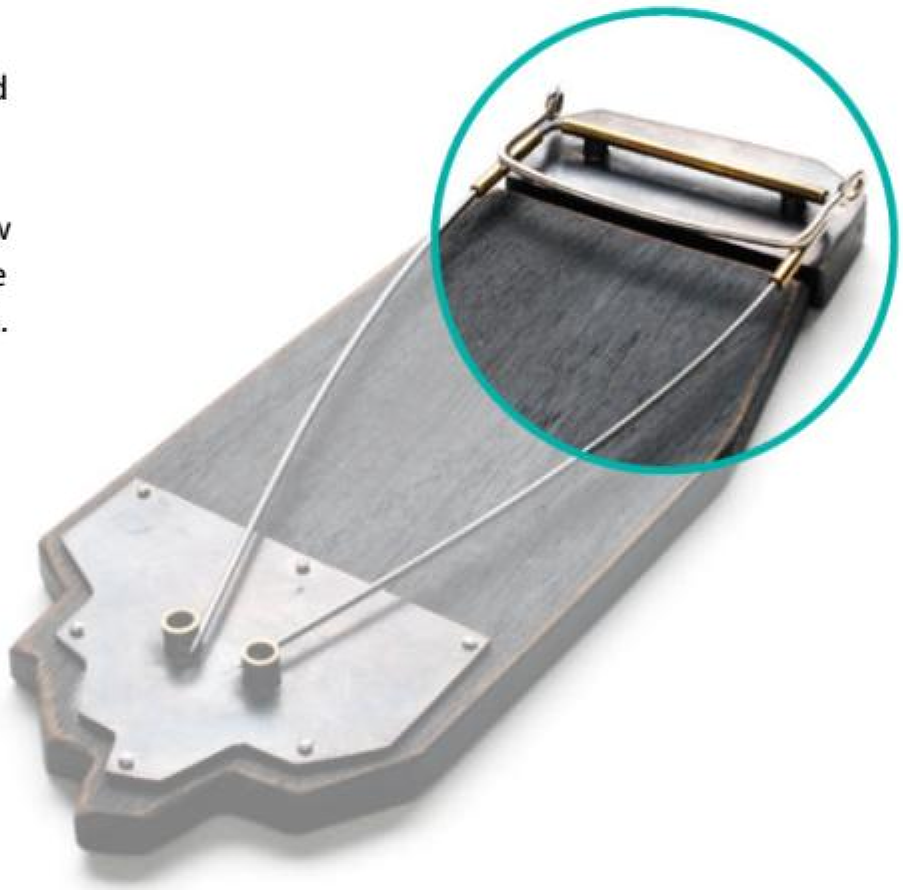
2 WIRE: Bend a piece of 18-gauge (1.0 mm) wire into a squared U-shape slightly wider than the distance between the outside edges of the two tubes so that it doesn't run into the tube holding the pin stem onto the piece (mine is about 5⁄64 in. [2 mm] longer on each side). The legs of the U-shape should point upward. Trim the legs to your desired length.

NOTE: There needs to be enough room to add a jump ring to the top of each end of the wire, so determine whether you want the jump rings to be visible when the pendant is worn. They can stay below and be hidden, or they can extend above the piece and become part of the design.

3 JUMP RINGS: Make two jump rings large enough for your chain. Use hard solder to solder them onto the ends of the U-shaped wire (see "Single Pin Stem: Horizontal," *page 45*, for how to do this).



Process photo by Tova Lund.



4 ASSEMBLY: Place the U-shaped assembly on top of the two tubes on the pin stems (make sure the jump rings are pointing toward the top of the brooch), and mark the wire and tubes where they meet. Place the tubes on a soldering board, maintaining the correct distance between them. Use the marks to align the U-shaped wire on top of them. You may need to use cross-locking tweezers in third hands to maintain the correct orientation (*photo above right*). Place a pallion of solder where the wire meets the tubes on the inside of the U-shape, and heat the assembly from what will be the bottom edge to pull the solder through the join. AJ

ASK THE ARTIST: TOVA LUND

What's on your workbench right now?

"Right now on my bench, you'll find antler and bone and a bunch of burs. I'm giving myself some much-needed time to experiment with a material that is new to me!"

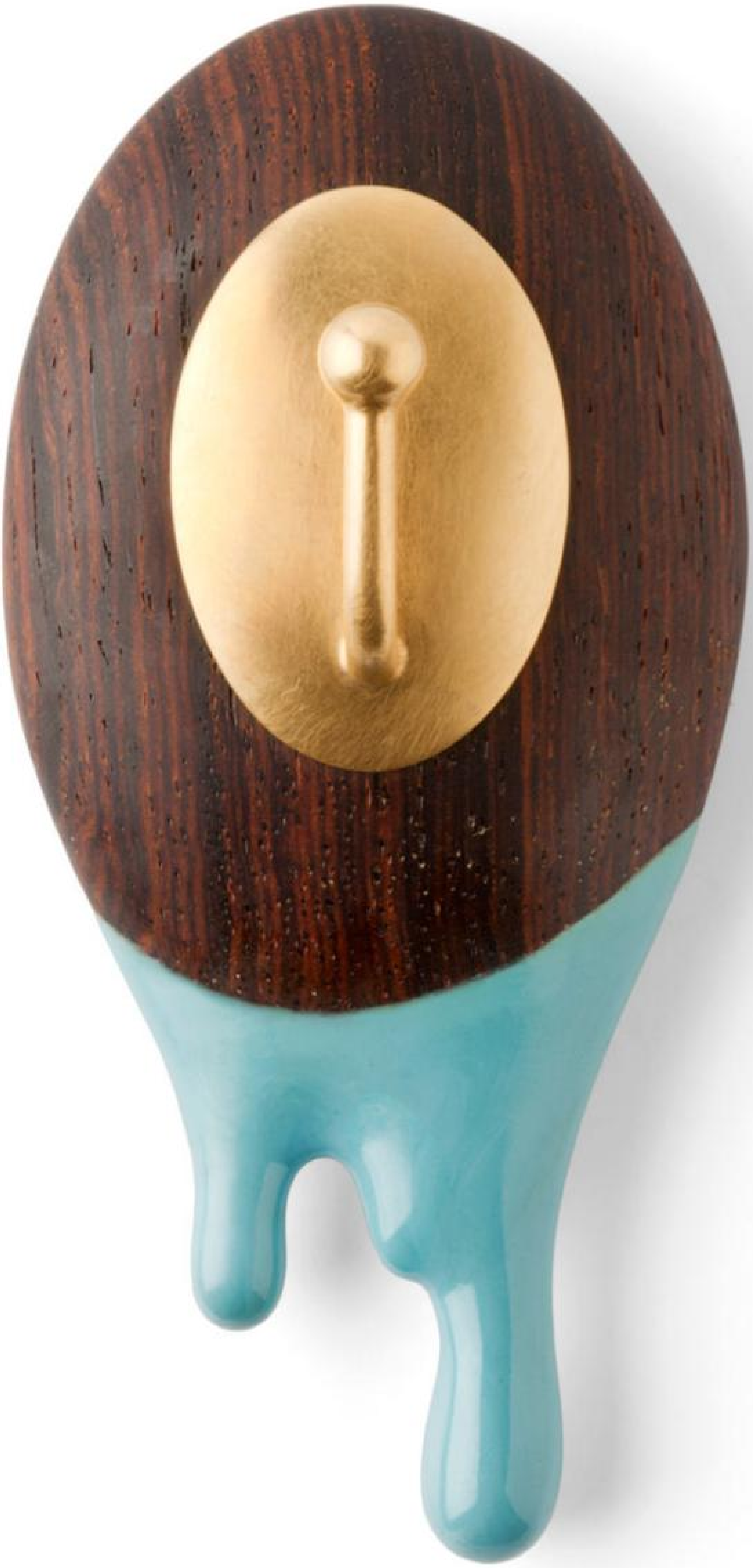
Contact: www.tovalund.com

Art+ After you cut your tubes, see "Four Ways to Flatten the End of a Tube" at **www.artjewelrymag.com/reference**.

GALLERY

We have to continually be jumping off cliffs and developing our wings on the way down.

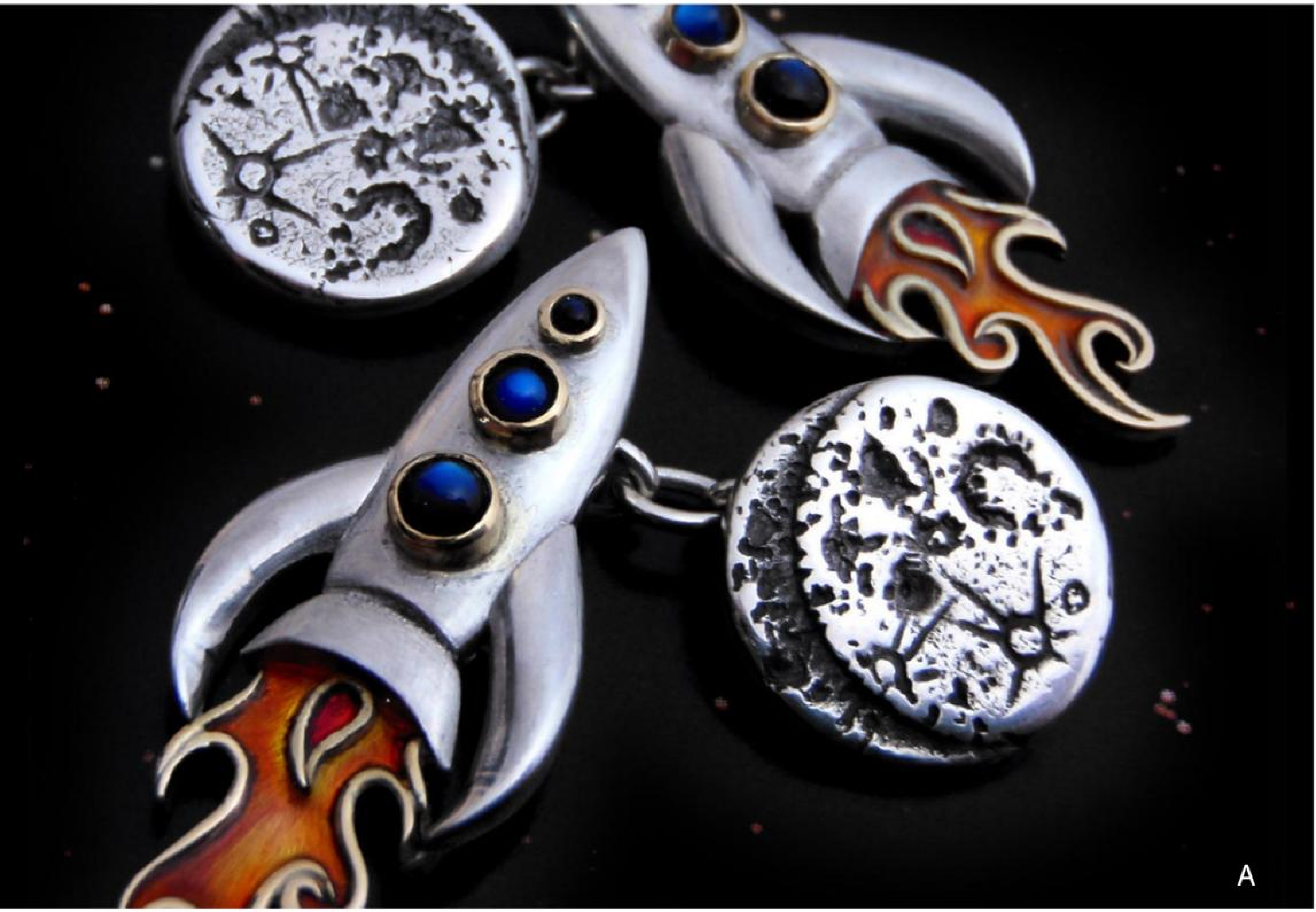
—Kurt Vonnegut



[page 47] Annette Dam's *Hang Ups* brooch has a dual meaning for the Danish artist. On one hand, the brooch represents a hook or a psychological blockage that she seeks to overcome. On the other, it comments on the human need to categorize and define things, an impulse that Dam herself seeks to avoid. The brooch is made of 14k gold, mahogany, epoxy, Milliput, and lacquer. 9 x 4.5 x 2.5 cm (About 3½ x 1¾ x 1 in.). Photo by Dorte Krogh.

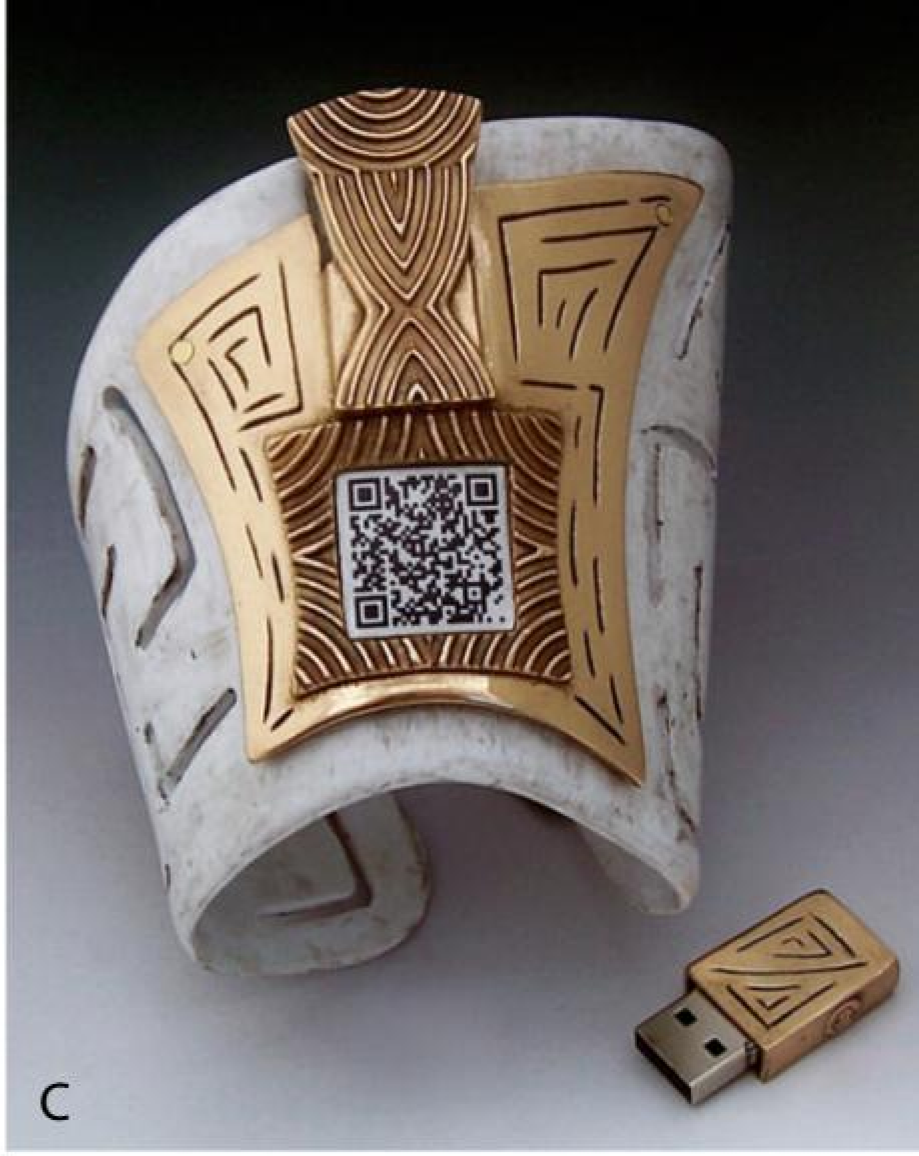
[A] Abi Cochran created her *Rockets to the Moon! Cufflinks* as a birthday gift for her partner, a longtime science-fiction fan. Influenced by Art Deco Sci-Fi illustrations, she made the twin rockets using sterling silver, 18- and 22k gold, blue moonstones, and resin. To make the moons, she first carved them in wax, then reproduced them in fine-silver metal clay. Says Cochran, "I spent a long time looking at photos of the moon!" Photo by the artist.

[B] Spencer Dickerson used jewelry techniques, including forming, engraving, soldering, and cold connections, to create his *Satellite of Love* toy, which is modeled on the Hubble Space Telescope. Dickerson used his own childlike wonder at the cosmos as inspiration and created a piece that recalled the era of early space exploration. Copper, sterling silver, and nickel silver. 7 x 8 x 6 in. (17.8 20.3 x 15.2 cm). Photo ourtesy of the artist.


A

[C] Inspired by ancient Celtic armbands, **Angela B. Crispin** created this cuff, titled *Wonder Woman's Attaché Case*, for the modern woman. Working with bronze metal clay, Faux Bone, paper, resin, and an 8GB USB drive, Crispin built a piece of adornment that also serves a practical purpose. Not only is the cuff a handy (and hands-free!) place for data storage (the USB inserts at the top center of the cuff), but the visible QR code in the front center of the cuff is customizable, and can be linked to the wearer's website, Facebook page, etc. Photo by the artist.

[D] Jon Ryan challenged his already-impressive sawing skills in order to make his untitled double-sided locket. Two precisely pierced sterling silver domes — each embellished with a marquise-cut peridot — open to reveal the interior photo. About 1 in. (25.5 mm) diameter. Photos by the artist.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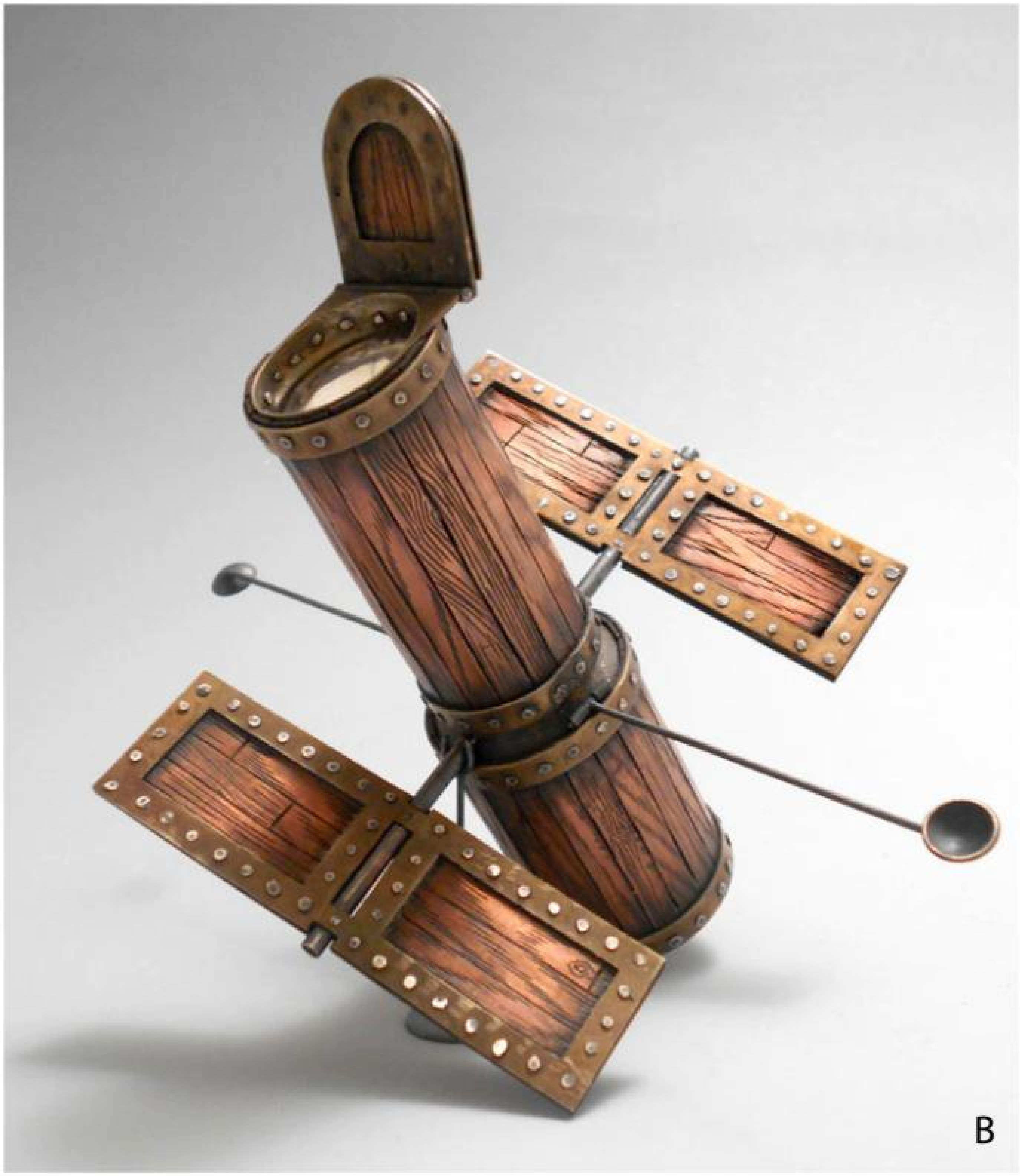
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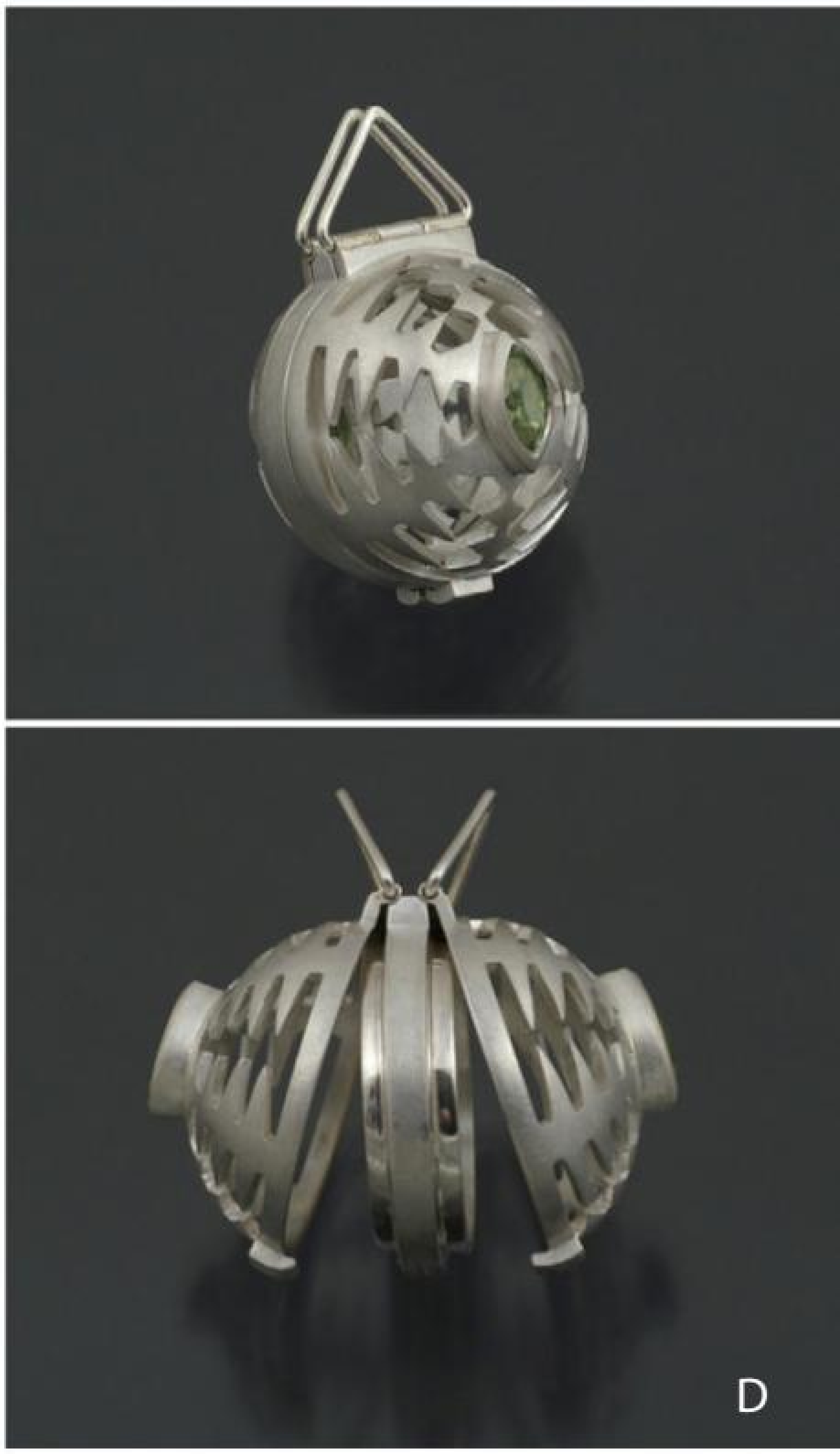
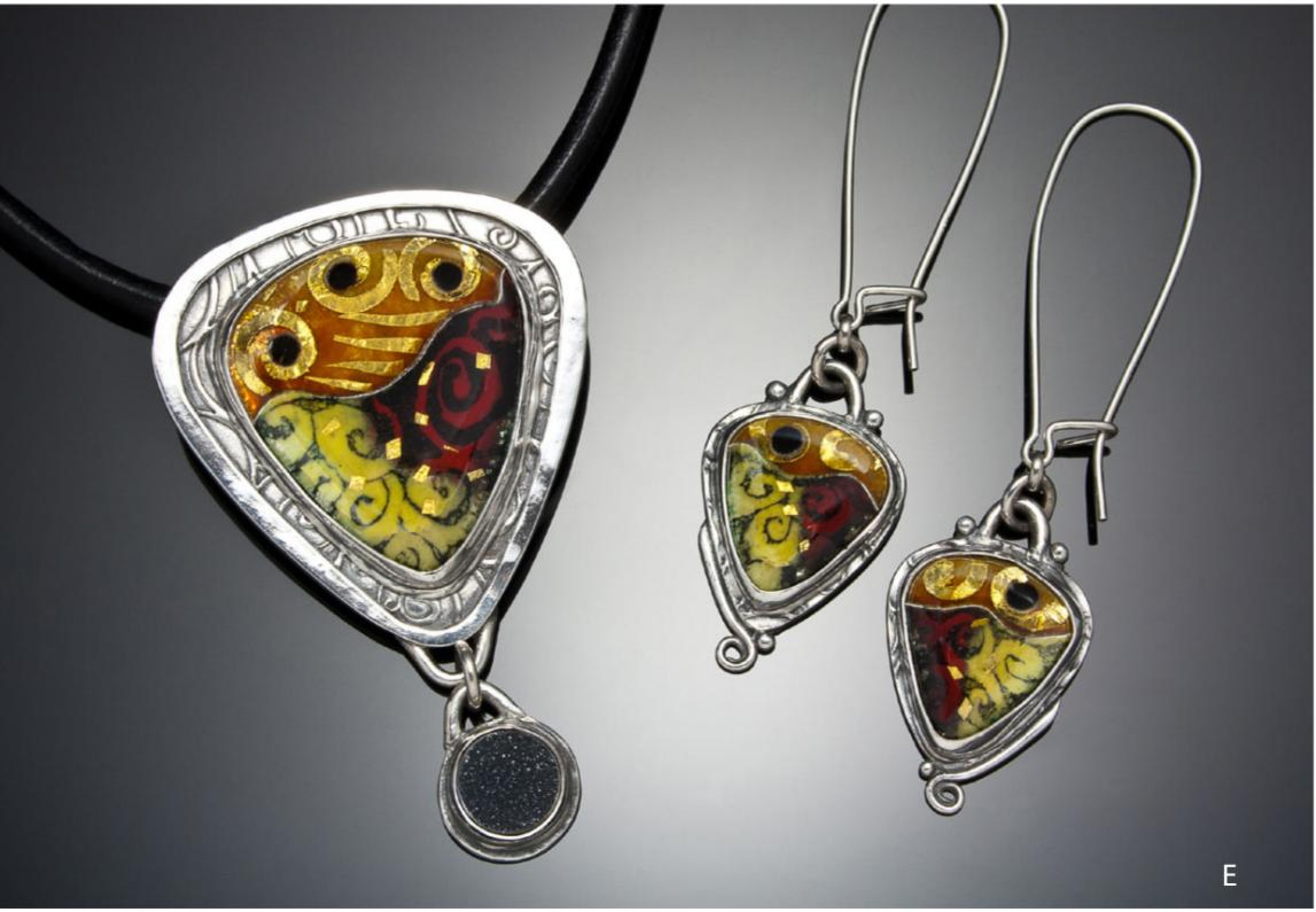

D

***To contact the featured artists, see Contacts*, page 79.**

[E] Monique Perry's long-standing fascination with color is in full view in her *Abstract* pendant-and-earrings set, made of fine-silver metal clay, enamel, and drusy quartz. Perry incorporated sgraffito techniques to add black freeform swirling patterns to the traditional cloisonné focal pieces. The pendant is 1½ x 2½ in. (38 x 63 mm); the earrings are 1 x ¾ in. (25.5 x 19 mm). Photo by Abby Johnson.

[F] While **Caitie Sellers'** sterling-silver-and-steel *Iglesia* brooch was inspired by line drawings she made during her travels in Xela, Guatemala, the stark imagery is less "this city" than "all cities." Sellers is fascinated more by what cities have in common — the way human beings influence their environment — than in a particular architectural style. 2¼ x 2¼ x ½ in. (57 x 57 x 13 mm). Photo by the artist.

[G] When building her *Arc* bracelet, **Nikki Nation** drew inspiration from the connections between man-made and natural systems — specifically how human architectural designs mimic and represent natural patterns. Working with sterling silver, she used lines, layers, and repetition to create both a rigid, defined structure and natural, flowing elements. 5½ x 5½ in. (14 x 14 cm). Photo by Annie Pennington.


E

[H] Romantic, feminine, and fanciful are the keywords for **Toni Tischer**'s hand-forged *Water Song* earrings. Tischer cites a combination of botanicals and fantasy as her inspiration, and her earrings evoke flower petals, leaves, and warm summer rain in the contrasting layers of high-polished and roll-printed Argentium sterling silver. 2½ x ⅜ in. (64 x 9.5 mm). Photo by the artist. AJ

F

send us your gallery submissions

For our guidelines, go to ***www.artjewelrymag.com/submit****, or send an email to* ***submissions@artjewelrymag.com****.*

Want more inspiration? You can see these and over 450 other pieces that have been featured in our Gallery at **www.artjewelrymag.com/gallery**.

G

H

To contact the featured artists, see Contacts, page 79.

Tube-hoop Earrings

by Marthe Roberts/Shea

Have you ever tried to bend tubing without kinking it? That's a technique that has plagued me for a long time. The commercial tools that are offered specifically for bending tubing never seem to work for me. I always wind up with extra dents and dings that I hadn't bargained for. This technique allows you to create smoothly curved tubes of any diameter.

materials

- Tubing:
  - Fine silver, sterling silver, or copper: thin-walled, annealed/dead soft, inside diameter (ID) determined by design, 12 in. (30.5 cm)
  - Copper: same or similar ID as tubing for earrings, 2 in. (51 mm)
- Sterling silver sheet: 30-gauge (0.26 mm), amount determined by design

toolboxes, *page 76*

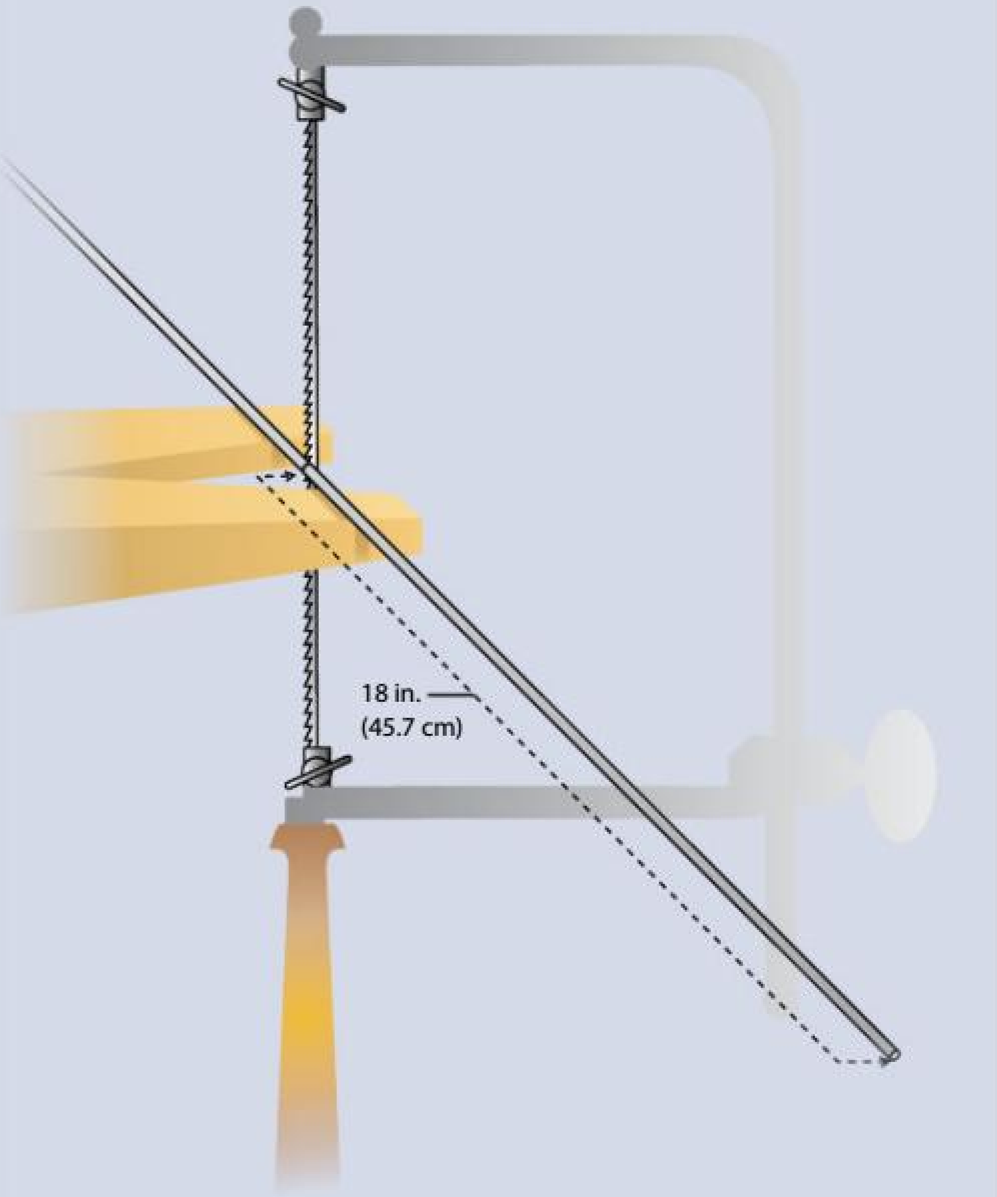
- Sawing/Piercing
- Soldering/Annealing

additional tools & supplies

- 01 Tool-steel rod: round, diameter determined by design, 18 in. (45.7 cm)
- Vises: clamp-on bench vise; heavy duty, bolted to workbench
- Half-round pliers
- Metal container with motor oil
- Paper towels or rag
- Fine sandpaper or #000 steel wool
- Drawplate
- Draw tongs
- Fine-tip permanent marker
- Scissor-type handheld shears
- Bench block
- Chasing hammer
- T-pins
- Container with hot water and about 1 T (14.8 mL) of baking soda

Find out where to buy supplies, *page 79*
See Safety Basics, *page 76*

STEEL ROD



1 Use a jeweler's saw with a #2 blade to cut an 18-in. (45.7 cm) piece of O1 tool-steel rod with a diameter of your choice.

NOTE: O1 is a common oil-hardening tool-and-die steel.

BASICS & VIDEOS

Learn fundamental techniques in these bonus tutorials:	B	🎥	
Sawing	●		
How to file		●	
Drilling through tubing			Art+
Using shears to cut metal		●	
Sweat soldering	●		
Pickle basics	●	●	

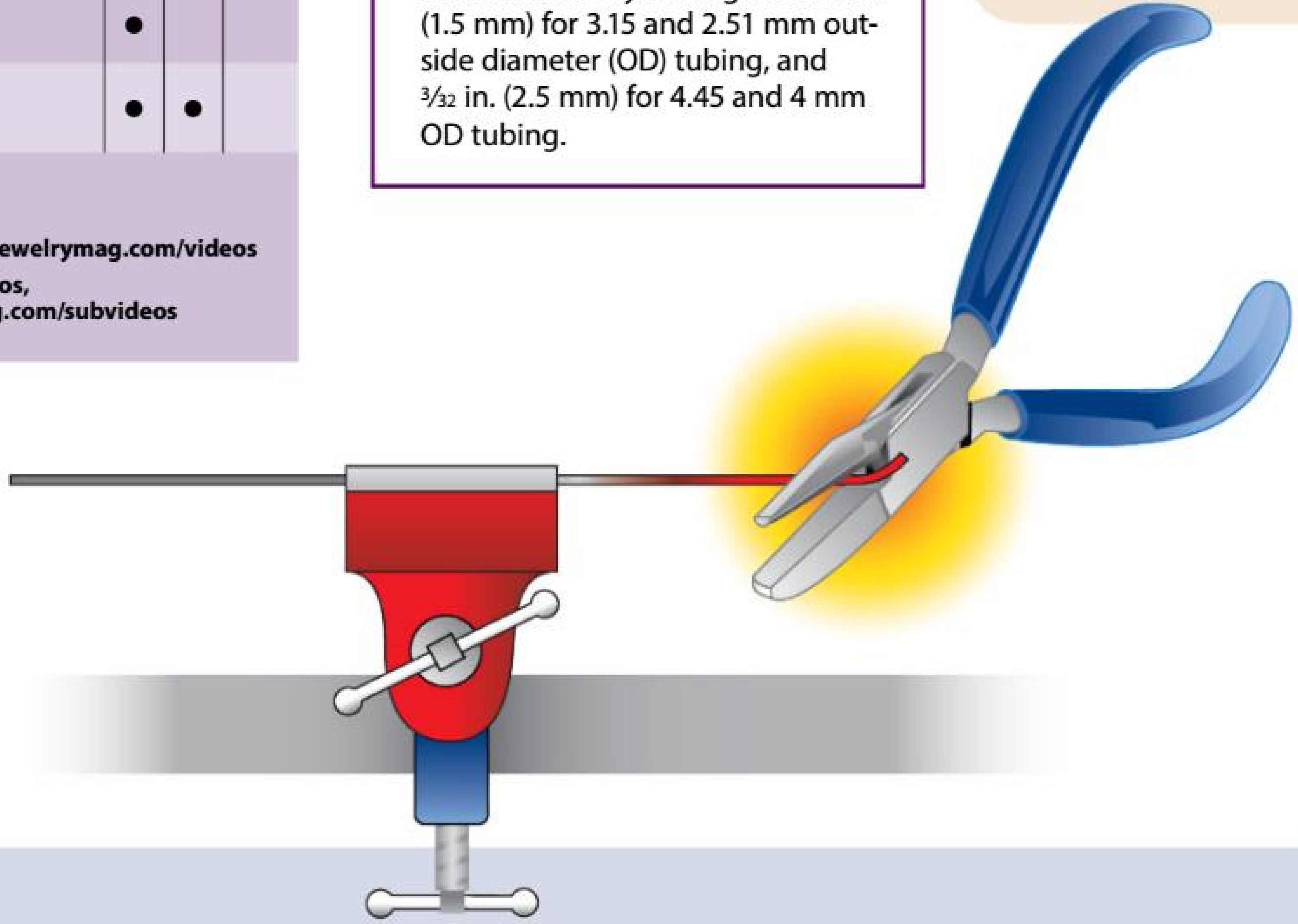
B Basics, *page 73*
🎥 Videos, www.artjewelrymag.com/videos
Art+ Subscriber videos, www.artjewelrymag.com/subvideos

what size rod should I buy?

For this technique, the tool-steel rod doesn't need to fit tightly inside the tubing. In fact, I find that it's good to have a little play (no more than 2.5 mm, though!)

Here's an example: The tool-steel rods I use for my earrings are 1⁄16 in. (1.5 mm) for 3.15 and 2.51 mm outside diameter (OD) tubing, and 3⁄32 in. (2.5 mm) for 4.45 and 4 mm OD tubing.

Learn the steps for how to "Anneal, Harden, and Temper Steel" at **www.artjewelrymag.com/reference**.



Harden the rod

2 Clamp a bench vise to your soldering table, and secure the rod in the vise. Use a torch to heat about 1 in. (25.5 mm) of the end of the rod until it glows red. Use half-round pliers to make a smooth curve in the end of the rod, about one-eighth of the desired hoop circumference.

Use cross-locking tweezers to quickly dip the end of the rod straight into a metal container of motor oil, and swirl it slowly until the rod stops smoking. Make sure to immerse the red-hot portion of the steel quickly and fully. Motor oil is flammable, and you must get the hottest part of the steel submerged quickly to prevent flare-ups. Remove the rod from the oil, and use paper towels to wipe off the excess oil.

⚠ **SAFETY NOTE:** Keep the motor oil about six inches away from you and behind where you heat the steel. This helps prevent you from knocking the can over after you grab the steel.

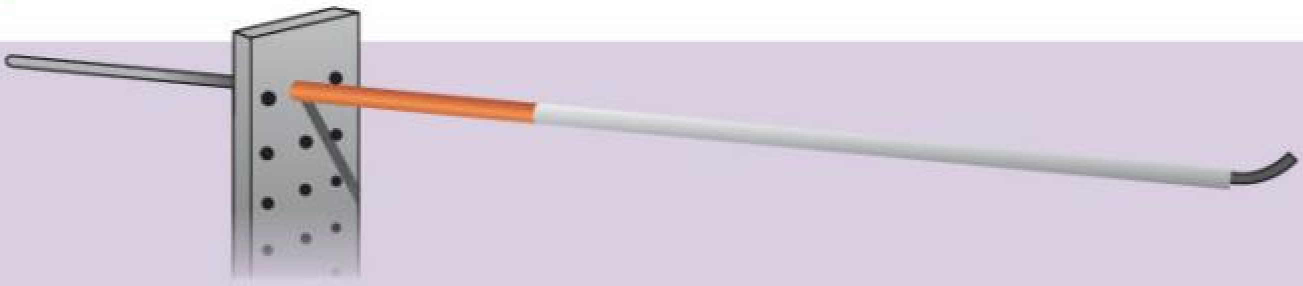
Use fine sandpaper or #000 steel wool to remove the carbon from the surface of the steel. (The steel needs to be free of carbon so that you can see the color changes when you temper it.) To test if the steel is hardened, run a file across the surface of the curved part of the rod. If the file skids across the surface and it sounds glassy, the steel is hardened.

Temper the rod

Place the rod back in the vise, and use a neutral flame to slowly heat the hardened end of the rod about 1½ in. (38 mm) in from the start of the curve. Watch carefully as the color of the steel changes. It will change from steel-gray to a light straw-yellow when it reaches about 410°F (210°C). Once you see the correct color, remove the flame immediately and quench the rod in the oil.

NOTE: Experiment with using a hardened-only steel rod and one that's been tempered to curve your tubing. The hardened-only rod will work for this project, but not for long. The steel might be hard, but it will be brittle, and will straighten after one try. Tempered steel will hold its shape a lot longer. Use copper or fine-silver tubing if you don't harden the rod.

COILED TUBE



3 Insert the straight end of the steel rod through a hole in a drawplate. The fit should be snug, but not tight; the rod should move freely. Remove the rod from the drawplate.

Secure the drawplate in a large, securely mounted vise with the selected hole in the drawplate positioned above the jaws of the vise.

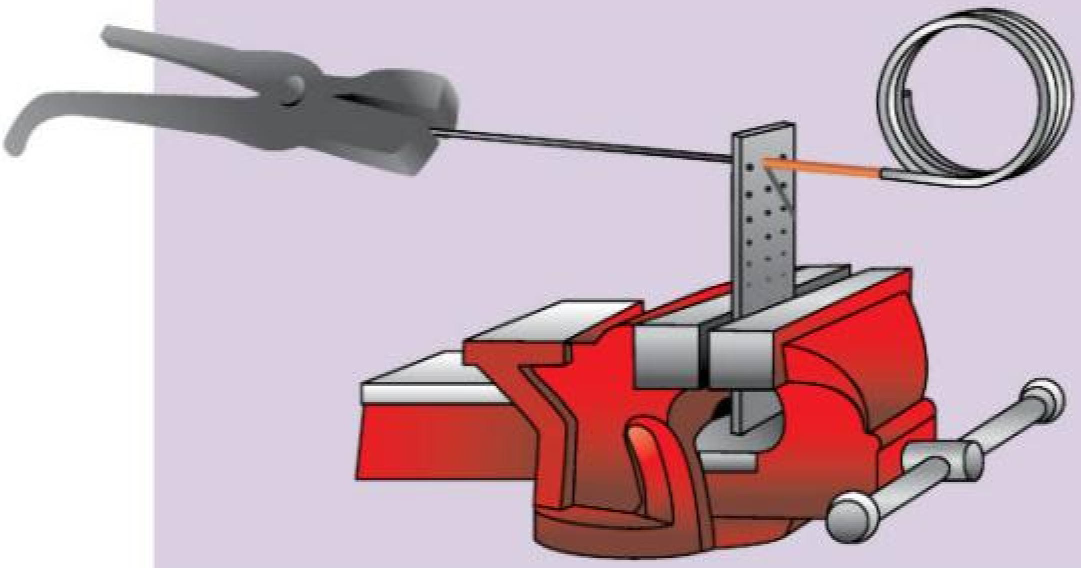
Thread a 12-in. (30.5 cm) length of tubing over the straight end of the rod until it meets the bend.

NOTE: Thin-walled tubing works best for this technique. Fine silver will work even better than sterling silver because it's more malleable. Practice with copper tubing first. It takes a bit of experimentation to get the results that you desire.

Add a 2-in. (51 mm) piece of copper tubing approximately the same diameter as the silver tubing (it shouldn't be able to be pushed over the silver tubing or fit through the drawplate). This will act as a pusher for the silver tubing.

NOTE: I've tried this technique with and without lubricant. Lubricant only provides a little bit of ease if the fit is really tight; it's a bear to clean out of the tubing; and it smells when you heat the tubing later. By having a little play between the rod and tube diameters, you don't need to use a lubricant.

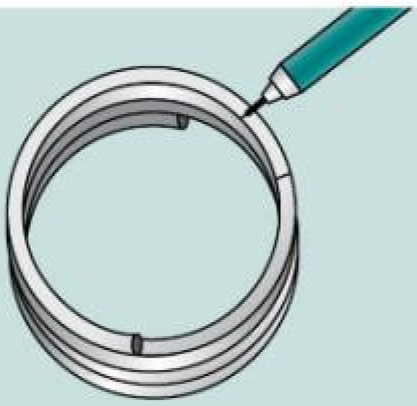
Place the assembly straight-end-first into the selected hole in the drawplate. About 3 in. (76 mm) of the rod should be sticking out behind the drawplate.



4 Use draw tongs to firmly grip the end of the rod behind the drawplate. Pull slowly and firmly, in one fluid motion, until the tubing starts to bend at the curve in the rod. Keep pulling until the tubing coils off the end of the rod. Depending on the diameter of your hoop, you should have at least 2–3 wraps in your coil.

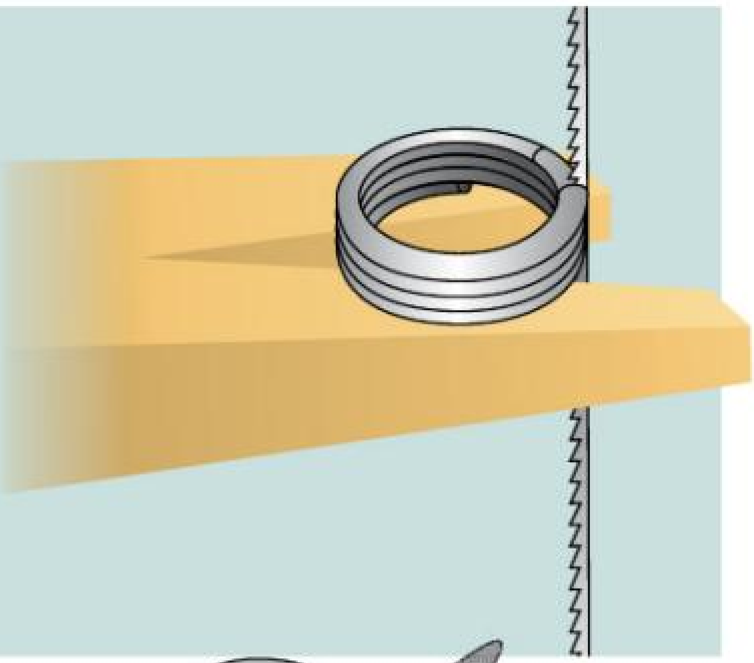
NOTE: The pusher may get stuck at the curve in the rod. If this happens, use half-round pliers to straighten the curve in the rod only enough to slide the pusher back down the straight length of the rod.

ASSEMBLY

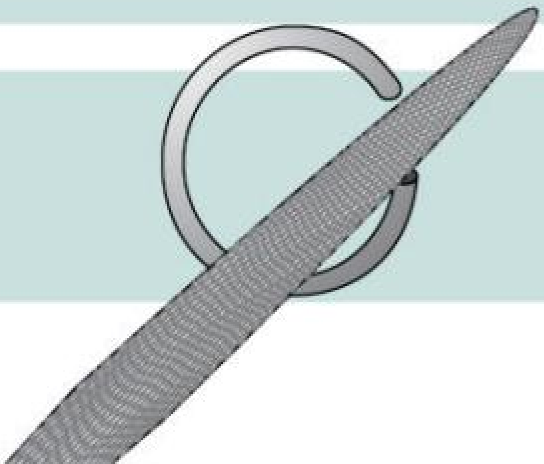


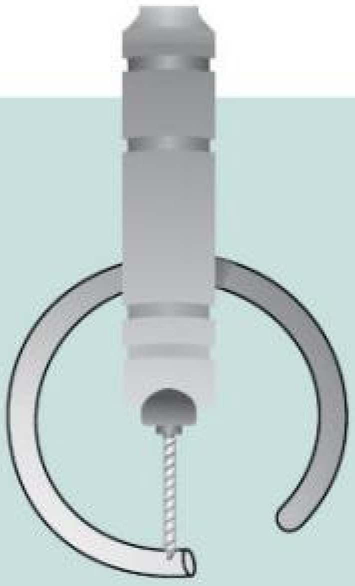
5 Use a fine-tip permanent marker to mark the tubing where you want each earring to begin and end. Allow for about ½–⅜ in. (13–9.5 mm) of open space for your earlobe.

6 Use the jeweler's saw with a lubricated blade to cut the tubing at the marks, similar to how you cut jump rings. Note that the cut tubes won't lie flat on the bench surface after they're cut: Don't straighten them yet. You'll use the offset ends to your advantage later.



7 File each end of the tubes flat.

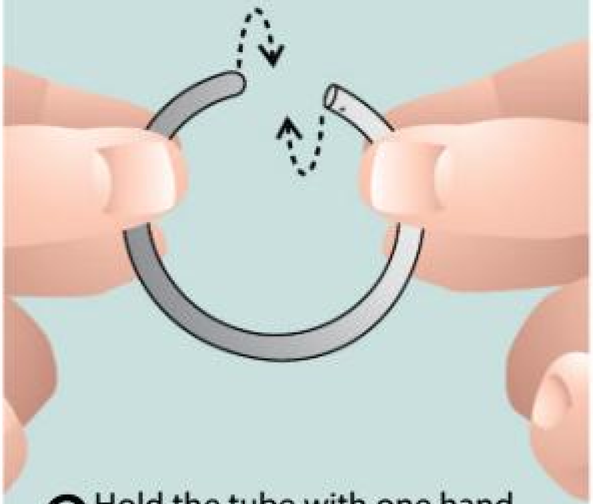




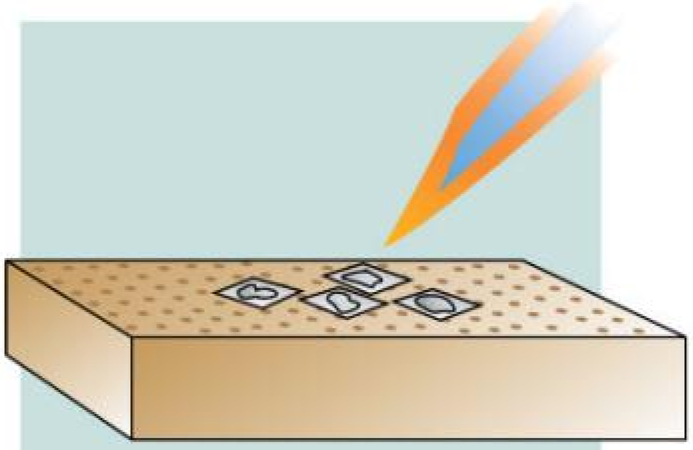
8 Use a scribe to make a divot about ¼ in. (6.5 mm) from one end of a tube on the inside surface. Because of the offset ends, it's easy to mark this point.

Use a #60 (0.040-in./1.02 mm) drill bit to drill a small hole through one wall of the tube at the divot.

NOTE: This hole will act as an air vent when you cap the ends of the tube.



9 Hold the tube with one hand on each side of the opening. Use the same motion you'd use to close a jump ring to gently twist the ends of the tube toward each other until they align.



10 Cut four small pieces of 30-gauge (0.26 mm) sterling silver a little larger than the opening of each tube. Place each piece on a bench block, and use a chasing hammer to flatten them.

Sweat a small pallion of solder onto each of the flattened sheets. Pickle and rinse the pieces.

11 Use T-pins to anchor one tube to the soldering board. One tube end should be parallel to the board.

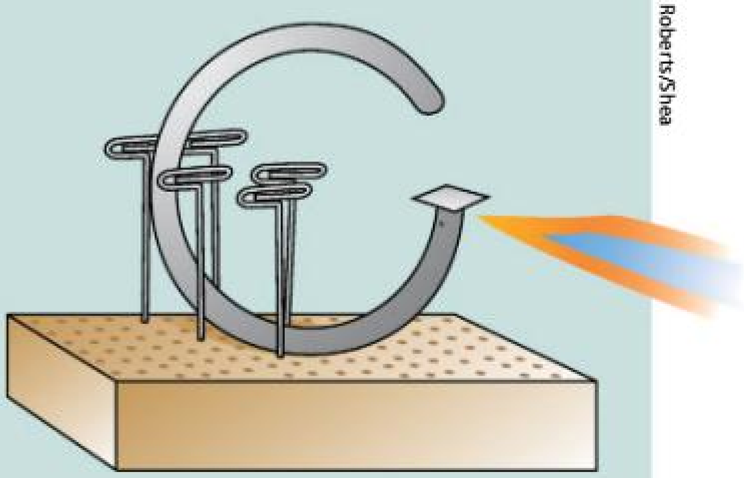
Place a 30-gauge (0.26 mm) piece solder-side-down on the end of the tube, covering the open end. Apply flux and use a gentle flame to draw the solder out.

NOTE: Remember, tubing does not react well with high heat; it has a tendency to melt quickly. It's better to heat the assembly slowly than it is to watch a piece of tubing collapse!

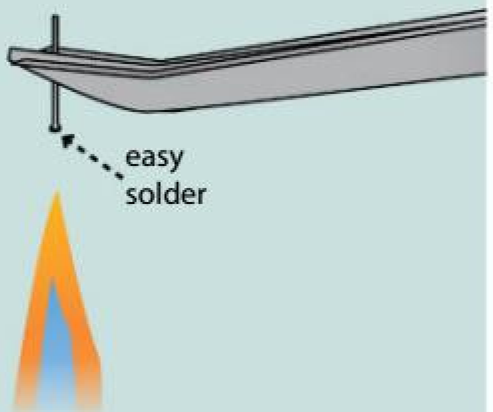
Repeat to solder an endcap onto each end of both tubes. Pickle, neutralize, rinse, and then dry the hoops.

NOTE: To neutralize pickle that may be trapped inside the hoops, submerge the hoops in a cup of very hot water that has about 1 Tbsp. (14.8 mL) of baking soda dissolved in it until the solution stops bubbling. Any pickle trapped in the hoop is now neutralized.

Use metal shears to remove any excess sheet, and the file the ends flush.



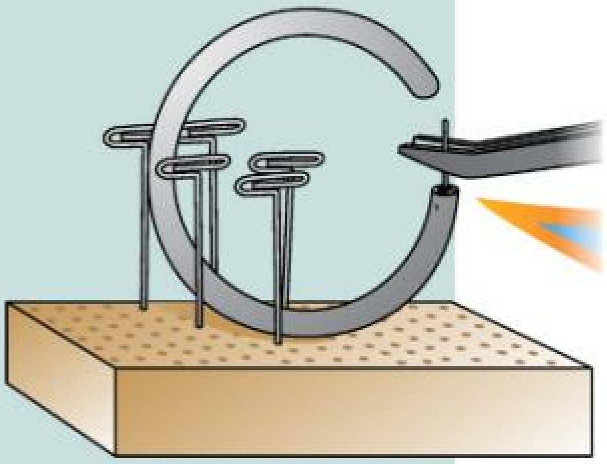
Illustrations by Martha Roberts/Shea



12 Use cross-locking tweezers to hold an earring post vertically, pad-side down. Sweat a small amount of easy solder onto the bottom of the pad. Repeat to sweat solder onto the second earring post.

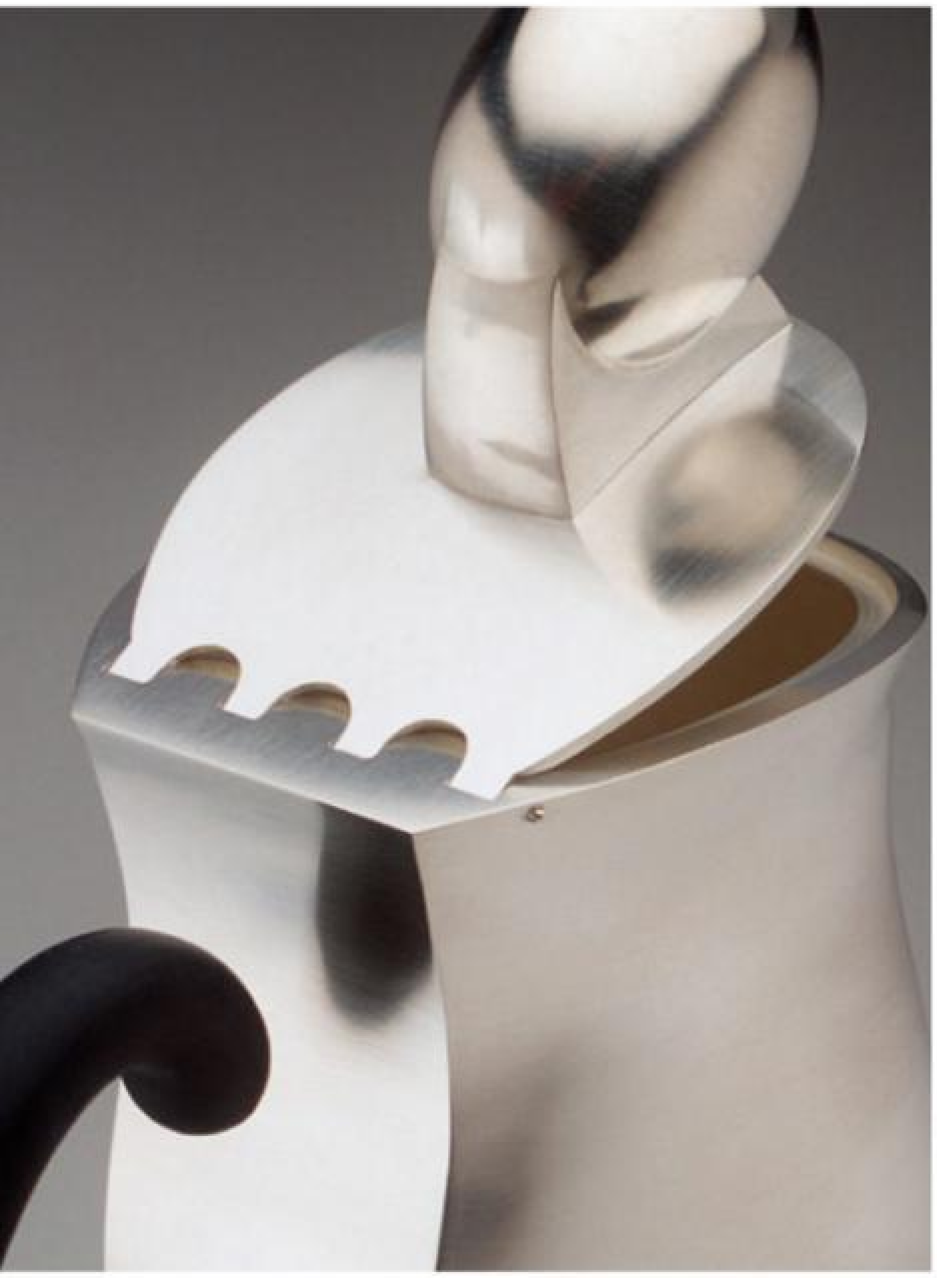
13 Use T-pins to prop up one hoop on your soldering pad. Make sure that the flat end nearest the drilled hole is parallel to the soldering pad. Apply flux to the cap on this end of the hoop.

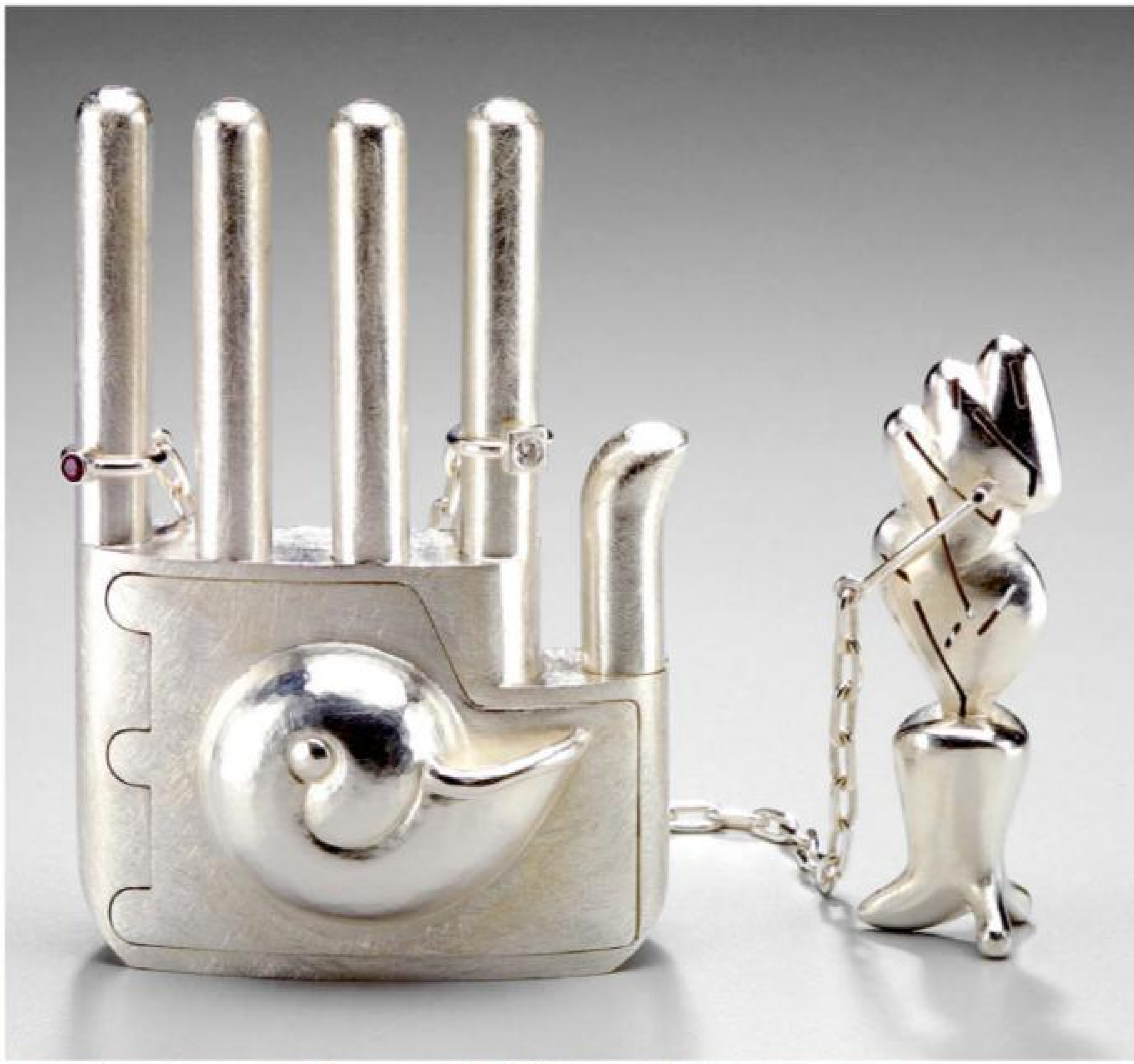
Hold the earring post at the center of the cap. Use a gentle flame to flow the solder. Pickle, rinse, and dry the earring. Repeat to solder the earring post to the second hoop. Finish the earrings as desired. AJ

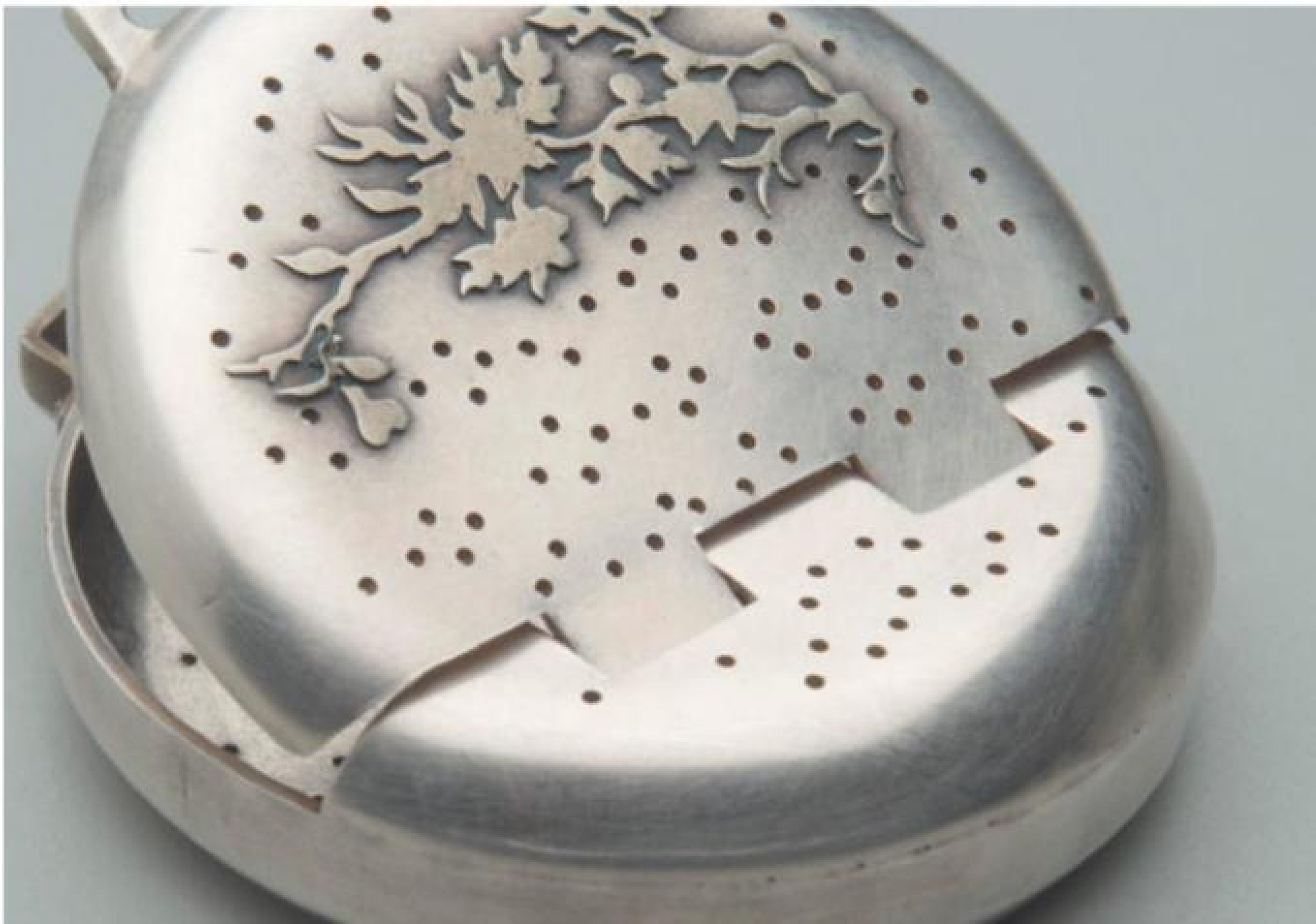


Marthe Roberts/Shea's work has been shown in galleries nationally and has appeared in Art Jewelry's *Gallery. She teaches jewelry making at the Cheltenham Center for the Arts (Cheltenham, Pa.) and the Main Line Art Center (Haverford, Pa.). She is also the president of the Pennsylvania Society of Goldsmiths. You can reach her via her website, www.jewelrybymars.com.*

HOW TO CONSTRUCT AN INVISIBLE HINGE







▲ In addition to being a great way to incorporate movement in your jewelry designs, integral hinges have a variety of other applications. *Androgyne*, a serving vessel by Tom Muir, incorporates an integral hinge in the lid. Sterling silver, aluminum, acetal handle; 11½ x 2¾ x 5 in. (29.2 x 7 x 12.7 cm); 2000.

▶ (*top*) In this tea infuser, *Watercraft*, Muir utilized an integral hinge to enclose loose-leaf tea. Turn the thumb one-quarter turn and the spring-loaded door opens. The rings swivel freely around fingers. Sterling silver, diamond, ruby; 2⅝ x 1¾ x 1⅛ in. (67 x 44 x 29 mm); 2001.

▶ This detail shot of Sunshine Vekas' tea infuser, *Planning A Wedding*, shows the precise fabrication required to make an integral hinge. Sterling silver, nickel silver; 4¼ x 4 x 3¾ in. (10.8 x 10.2 x 9.5 cm); 2004. Photos of finished pieces by Tim Thayer.

Precise layout, precise filing, and precise fit are key to constructing a mechanism that disappears into your piece.

by Tom Muir

This mechanism is most commonly called an integral hinge, but some people refer to it as an invisible hinge because the segments almost disappear when closed. Making this elegant hinge offers the metalsmith a challenging exercise to learn the technical aspects of the mechanism. While there *is* some minimal soldering involved, the process mainly involves precision measuring, sawing, and filing. There are innumerable variations to the basic hinge, each of which can add integrity to your work and enhance its aesthetic, function, and engineering.

Determine your hinge pattern. Decide how many knuckles/fingers you want your integral hinge to have. (Knuckles are the tubes into which a pin is inserted to allow the hinge to move; the fingers in this style of hinge are the narrow strips of metal that extend beyond the knuckles.) All hinges should have an odd number of knuckles, or the hinge pin may bind to opposite sides of the hinge, causing the pin to work-harden and, eventually, snap.

NOTE: I'm going to demonstrate how to make a five-part hinge with equal knuckle/finger widths. If you choose to make a three-part hinge, make sure the center section is at least the length of the two outside sections combined.

The fingers of the hinge must be parallel where the tubing will pass through, or else the hinge won't work properly. See **[Figure 1]** for an example of an acceptable and unacceptable design.

Lay out your hinge pattern on a piece of paper, making note of all measurements (you will be re-creating your design on metal, not using this paper template, so make sure to take notes).

NOTE: To eliminate the need to backfile your hinge, you can also design gaps into your work so that the fingers have clearance for the hinge to open **[Figure 2]**. These gaps will be visible when the hinge is closed.

Prepare side 1. Use your torch to bring a piece of 14- or 16-gauge (1.6 or 1.3 mm) metal sheet the size required for your design to annealing temperature across the entire sheet.

NOTE: You can use nickel silver, bronze, brass, Nu-gold, or sterling silver for this technique (I'm using Nu-gold). Don't use copper or fine silver; they are too soft for this technique.

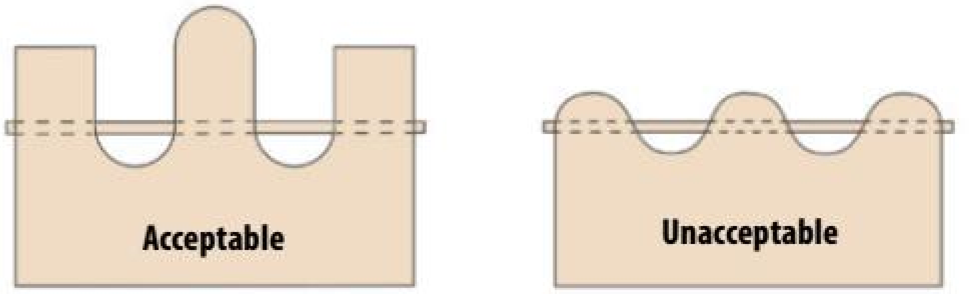


Figure 1

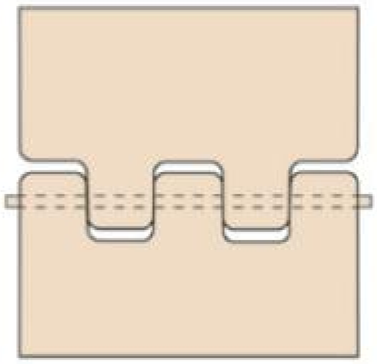


Figure 2

See more Acceptable/Unacceptable hinge patterns at **www.artjewelrymag.com/reference.**

materials

- Metal sheet: 14- or 16-gauge (1.6 or 1.3 mm), type and amount determined by design
- Tubing: 2–3 mm outside diameter (OD), medium or thick walled, amount determined by design
- Hinge pin: same metal as tubing, stainless-steel hypodermic tubing, or nickel silver; same diameter as the inside diameter (ID) of the tubing, amount determined by design

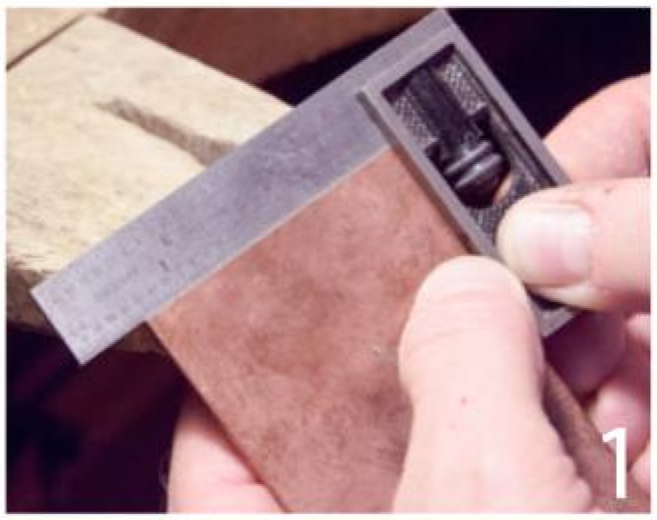
toolboxes, page 76

- Soldering/Annealing
- Sawing/Piercing

additional tools & supplies

- Flat piece of steel (you can also use an old-fashioned iron or stationary planishing hammer)
- Magnifiers (optional)
- Files:
  - Barrette or equalling, flat, 6–10 in. (15.2–25.4 cm), #0 or #00 cut
  - Pillar, 6–10 in. (15.2–25.4 cm), #2 or #3 cut
  - Joint-edge, parallel, or round, same diameter as OD of tubing
  - Triangle (optional)
- Square
- Vernier gauge
- Permanent marker
- Calipers
- Sharp sewing needle
- Superglue or quick-set epoxy
- Tape:
  - Duct
  - Painter's or masking
- Thick sheet of glass (optional)
- Separating disk or diamond wheel, ½–1 in. (13–25.5 mm)
- Tube-cutting jig
- Temporary alignment pin, same diameter as ID of tubing; amount determined by design
- Square-head protractor

Find out where to buy supplies, *page 79*
See Safety Basics, *page 76*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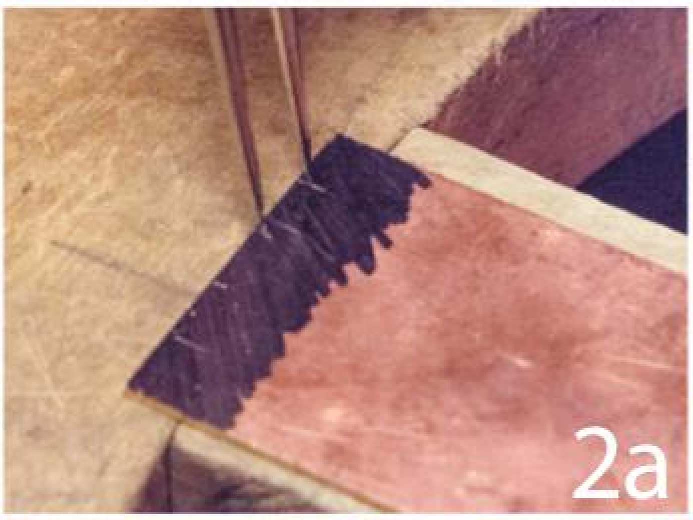
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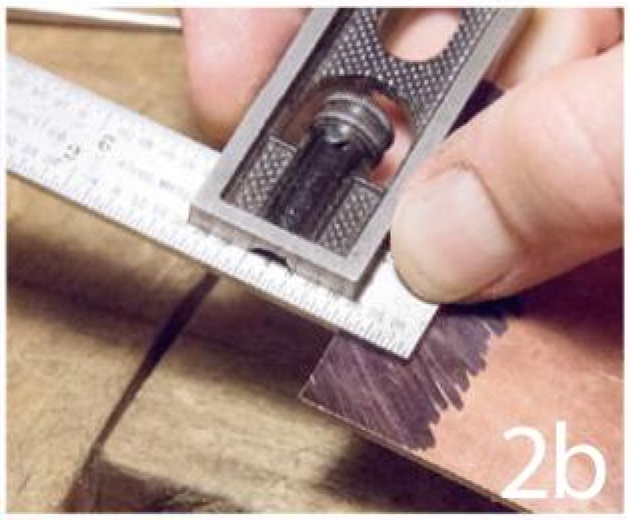
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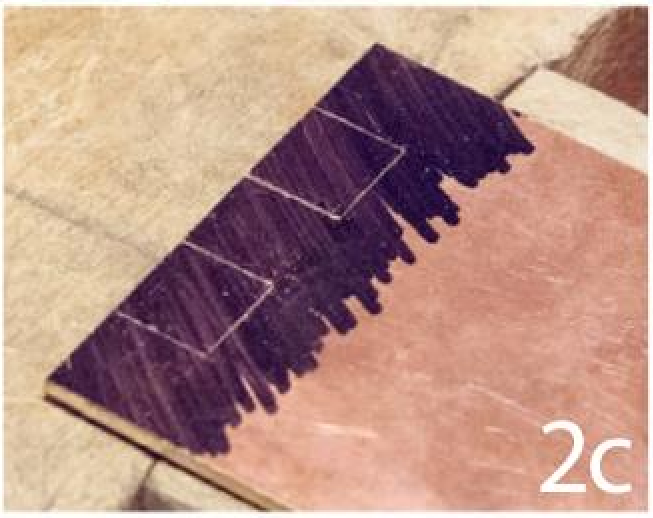
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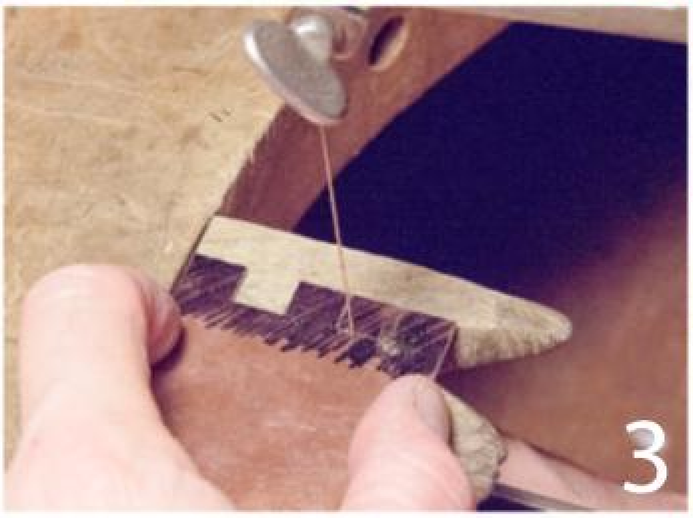
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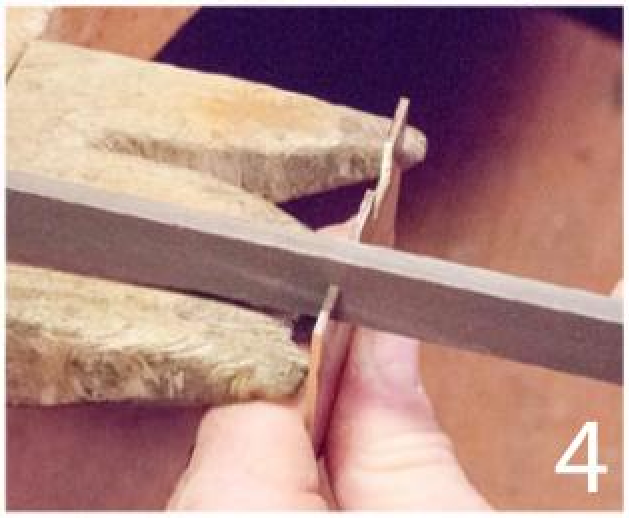
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To get the sheet as flat as possible, use firebricks to build an open-faced kiln to contain the heat. Lay the sheet flat on the firebrick and heat it with the torch. Once the sheet reaches annealing temperature, press down on the sheet with a firebrick, flat piece of steel, or an old-fashioned iron. (I've also used a stationary planishing hammer, but that luxury isn't usually available in most home studios.) Place the sheet in pickle to remove oxidation, and then rinse and dry it.

Use a large, #0- or #00-cut, flat barrette or equalling file to square the front edge of the metal for side 1 (the side of the hinge with three fingers) and both side edges perpendicular to the front (see "Filing Tips," *opposite page*). Use a square **[1]** or Vernier gauge to ensure the front edge is square to at least one side edge.

BASICS & VIDEOS

Learn fundamental techniques in these bonus tutorials:	B	🎥	
Annealing metal	●	●	
Pickle basics	●		
How to file		●	
Basic sawing of metal	●		Art+

B Basics, *page 73*
🎥 Videos, www.artjewelrymag.com/videos
Art+ Subscriber videos, www.artjewelrymag.com/subvideos

NOTE: This technique requires extreme precision; aim for 0.1 mm accuracy when filing, sawing, and refining, or the hinge may not work properly. There's no room in this process for rushing or sloppiness.

Use a permanent marker to cover the surface of the metal for side 1 near the front edge to make your layout marks more visible.

NOTE: Complete side 1 of the hinge, and then use that piece as a template for side 2. This will ensure that the two pieces fit together perfectly.

Lay out the hinge template on side 1. Use calipers, dividers **[2a]**, the Vernier gauge, the square **[2b]**, and a sharp sewing needle or scribe to make sharp, clear lines to accurately lay out your hinge template on the metal **[2c]**.

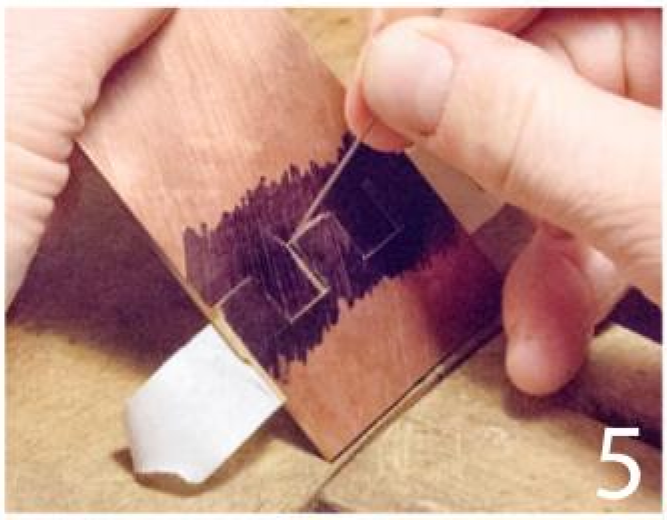
Cut out side 1. Use a jeweler's saw with a 2/0 or 3/0 saw blade to cut the fingers of your pattern **[3]**. Stay outside the line so that you can later refine the shape.

Use a 6–10-in. (15.2 x 25.4 cm) #2- or #3-cut pillar file to file the edges of the fingers of the hinge at a 90° angle to the sheet **[4]**. Don't round the edges. (There's no need to file the back or sides of the sheet that are not part of the interlocking fingers.) You're aiming for a 0.1 mm degree of accuracy, so work slowly. Once perfectly cut and filed, side 1 of your hinge will be used as a template for side 2.

Prepare side 2. Anneal and flatten the metal sheet for side 2, and square the front edge and at least one side edge of the sheet, as you did for side 1. Use a permanent marker to cover the surface of the metal of side 2 near the front edge.

Cut out side 2. Use tiny drops of superglue or quick-set epoxy to secure side 1, marked-side-up, on top of the side 2 metal. Make sure the leading edge of side 2 (the ends of the fingers) is aligned with the cut-out sections of side 1 (the webbing of the fingers, so to speak). You can use a strip of masking tape on the back of the metal to help secure the two pieces. Use the sewing needle or scribe to carefully trace the perimeter of side 1 onto the metal for side 2 **[5]**. Make multiple passes to ensure deep, accurate lines.

Use your hands to quickly snap the two pieces apart, use a torch to gently warm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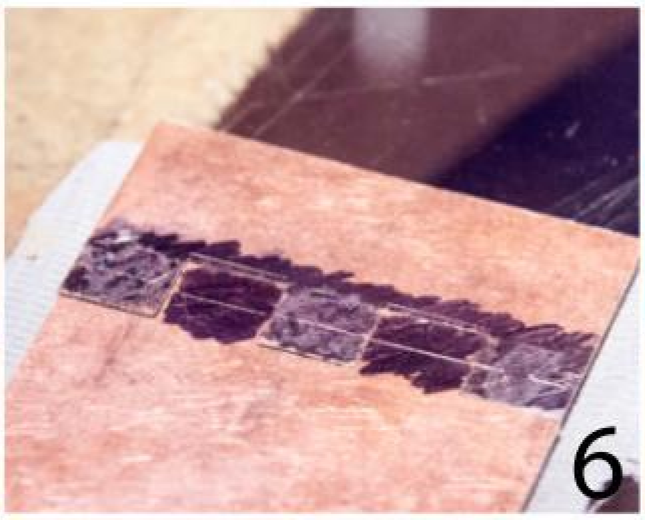
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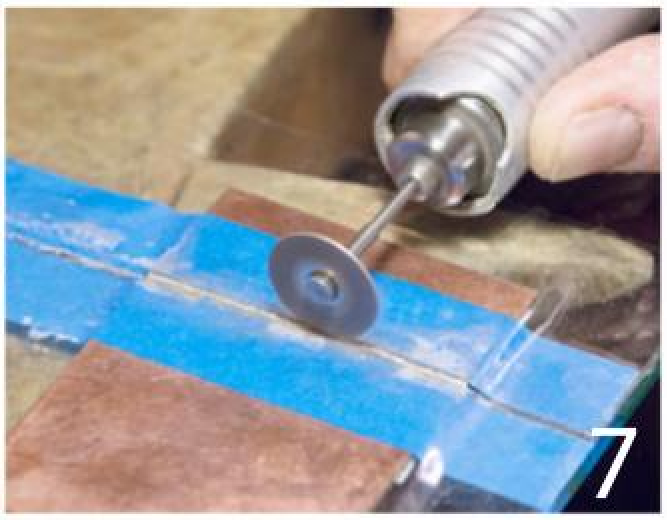
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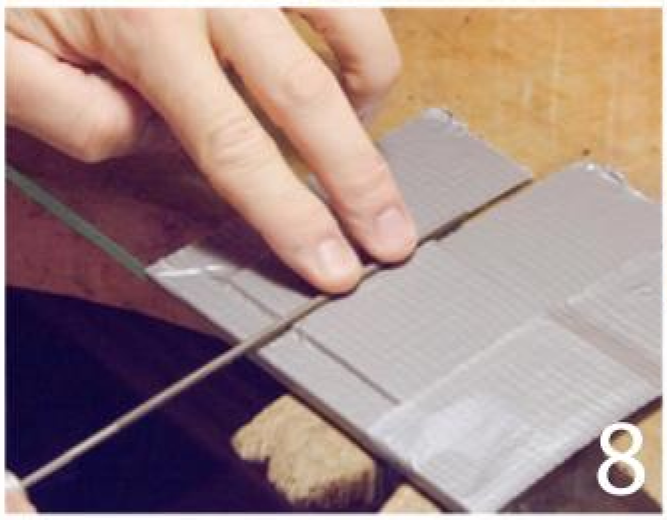
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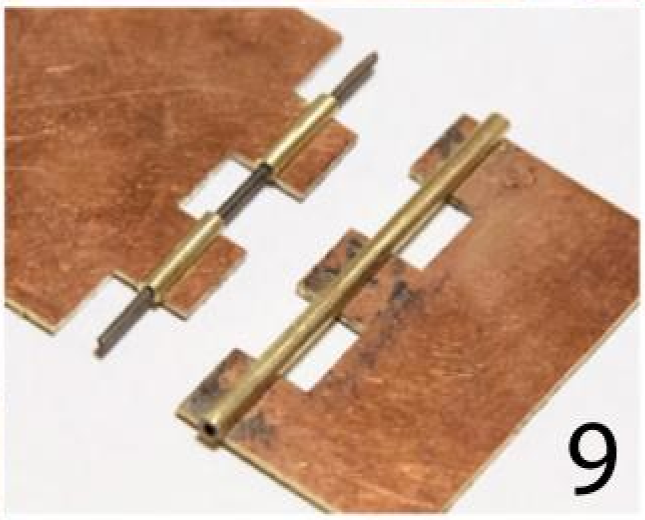
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the sheets, or soak them in warm water until they can be separated.

Saw on the outside of the scribed lines on side 2, and then file up to the lines. Go slowly, and check your progress regularly by holding side 1 and side 2 up to a light source to see where metal needs to be removed. The interlocking fingers should be a snug fit, with no gaps.

Start the tubing channel. Apply duct tape across the join on what will be the top of your hinge (opposite where the tubing will be soldered). The tape will hold the two pieces together, ensuring the groove, which will seat the tubing for the hinge, is perfectly aligned.

Tape the interlocking sides bottom-side up onto a flat surface (I use a thick glass sheet). Scribe a line perpendicular to the edge of the sheet and centered across the fingers of the hinge **[6]**. Apply a piece of painter's or masking tape to the metal on each side of the scribed line, leaving about a 2 mm gap on either side of the line.

Use a separating disk or diamond disk in a flex shaft **[7]**, or a triangular file to make a straight groove on the scribed line; this is the beginning of the channel for the tubing. Make sure the groove is parallel to the narrow edges of the sheets. Use duct tape to secure the metal sheets to the glass to ensure they don't move.

Refine the channel. Use a joint-edge or round file the same diameter as the tubing you will use for your hinge **[8]** to file 50–90% of the way through the thickness of the metal. Remove the tape, and separate the two sides.

Cut the tubing. Use a tube-cutting jig and the jeweler's saw to cut 2–3 mm OD medium- or thick-walled tubing (I'm using brass). Cut two tubes that are 5⁄32 in. (4 mm) longer than the width of each finger on side 2 and a single tube 5⁄32 in. (4 mm) longer than the width of the entire sheet of side 1. Insert a temporary alignment pin into the tubes to act as a heat sink for when you solder them to the sheet (and to help keep the two small tubes aligned).

NOTE: Alignment pins can be straight steel wire (such as music wire or an old drill bit), or other materials such as graphite, nickel silver, or titanium the same diameter as the inside diameter (ID) of the tubing.

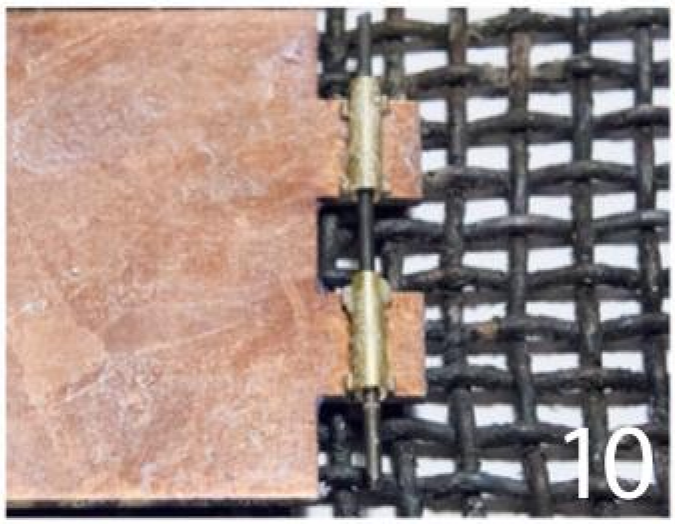
Lay the tubes across the channel, as shown **[9]**. The long tube should bridge the three fingers of side 1, and the two short tubes should be centered on the two fingers of side 2. Set side 1 and the two short tubes aside.

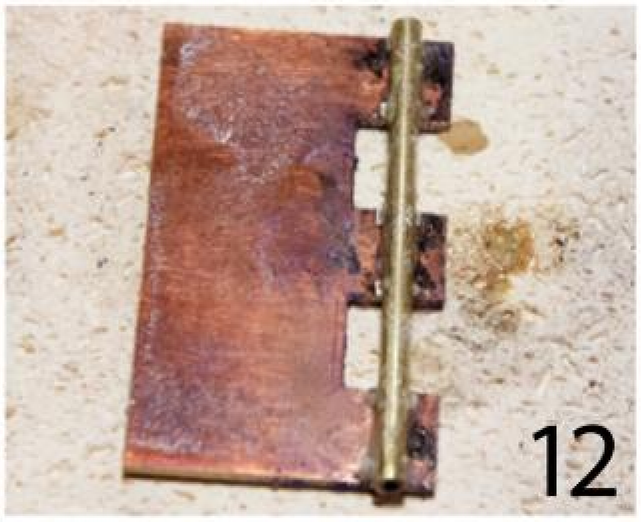
filing tips

Filing a straight or flat section of metal (such as the edges of the sheet or the channel in this technique) may seem easy, but it's hard to keep your file level without some practice. It's natural to end up filing a slight arc from one end of your metal to the next, so here are some tips for filing a flat, level edge or channel.

Do not flex your wrist when holding the file. An imaginary straight line should run from the tip of the file to your elbow. If you're not experienced at this, have someone watch you and correct your positioning — you can't see yourself and won't be aware of your improper positioning. Every few strokes, check your metal to make sure you're filing true. I like to use light reflection off of the edge of the metal to check the straightness and accuracy of my filing. There should be one flat edge, not a series of facets, all at varying angles. When filing a straight or flat section of metal, I always "feel" the flat as I'm filing.

Watch Tom Muir demonstrate how to file the hinge fingers, the channel for the tubing, and two ways to solder the tubing to the sheet at **www.artjewelrymag.com/videos**.





Solder the tubes to side 2. Place side 2 on a flat soldering screen on a tripod, apply flux to the joins, and add four pallions of solder to each tube, as shown **[10]**. Build an open-face firebrick "kiln" around the tripod **[11]**. (You can use a firebrick or other flat soldering surface instead of the tripod, but I like to be able to heat the piece from below.)

NOTE: This setup directs more heat toward the metal, so it comes up to temperature much more quickly. It will also provide you more control of the heat and will help the solder to flow before the flux burns up, resulting in cleaner solder seams.

Heat the assembly evenly until the solder flows. Use a soldering pick to coax the solder along the join, and check to make sure the join is complete.

Solder the tube to side 1. Solder the long tube to side 1 (I used a firebrick) **[12]**. Pickle, rinse, and dry the hinge.

Remove the bridged tubing on side 1. Use the jeweler's saw to cut and remove the tubing that forms a bridge between the three fingers of side 1 **[13]**. Use the pillar file to file the excess tubing on each side of each finger, making sure not to change the size of the finger **[14]**. Repeat for side 2.

Backfile sides 1 and 2. Fit sides 1 and 2 together, and run a temporary, snug-fitting alignment pin through the tubes. Your hinge will now open inward, toward the bottom sides of the sheets, but will not open upward until you backfile the lower sections of the hinge **[Figure 3]**.

Use the pillar file to file the underside of the spaces between the fingers on side 1 and side 2 to a 65–70° angle **[15]**. Use a protractor to guide the angle of the backfiling **[16]**. (I sometimes cut paper to the correct angle and use that as a guide.)

File the metal to a knife-edge; avoid removing any metal from the top surface.

NOTE: A common mistake is to file at too steep an angle, such as 45°. The danger of backfiling at too steep of an angle or removing metal from the top surface is that a visible gap may form on the surface of the hinge when it's assembled.

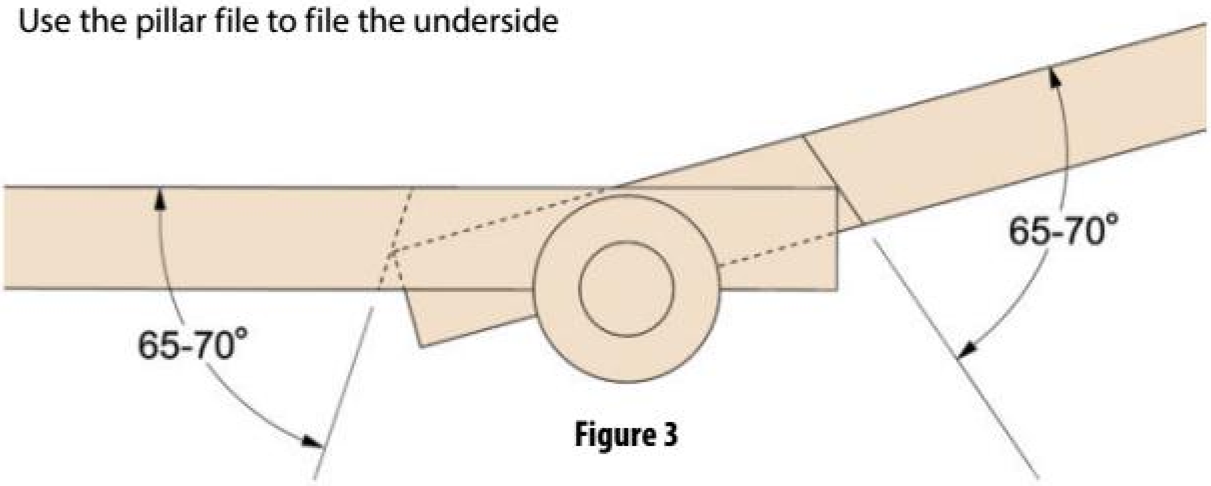
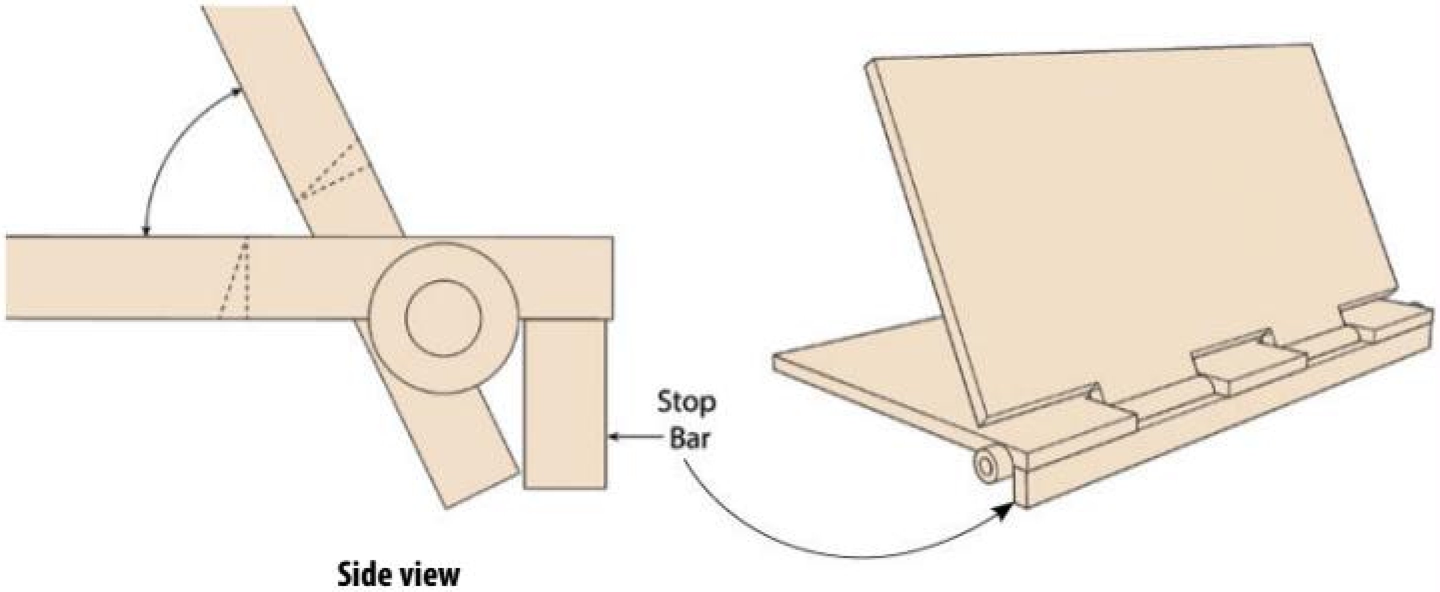


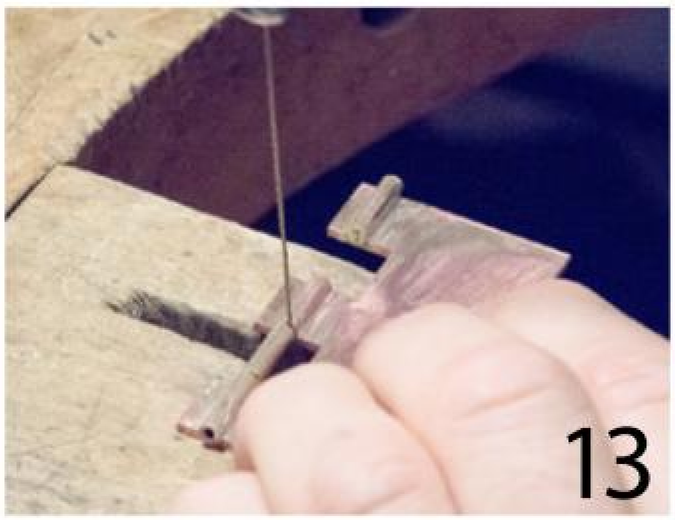
Figure 3

stop the hinge

If you wish to limit the motion of your hinge to prevent it from opening too far, solder or rivet a stop bar to the underside of one side of the hinge. This bar will stop the fingers of the movable side at the desired location.



Side view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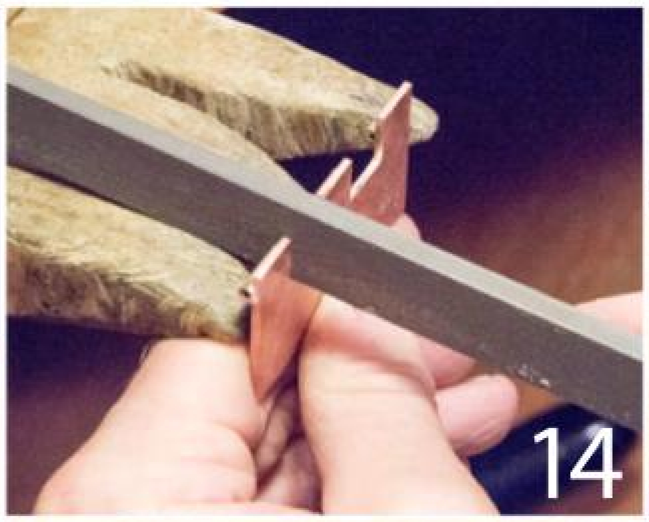
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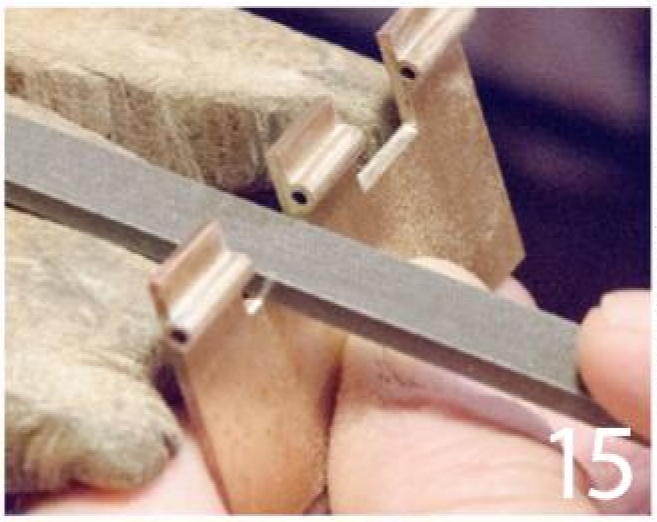
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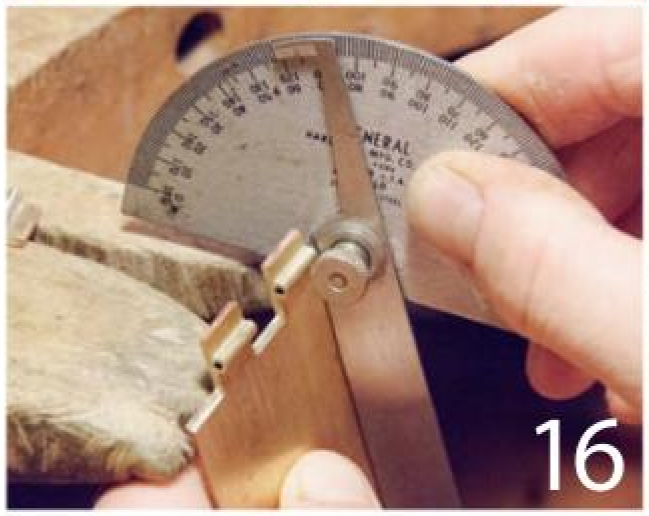
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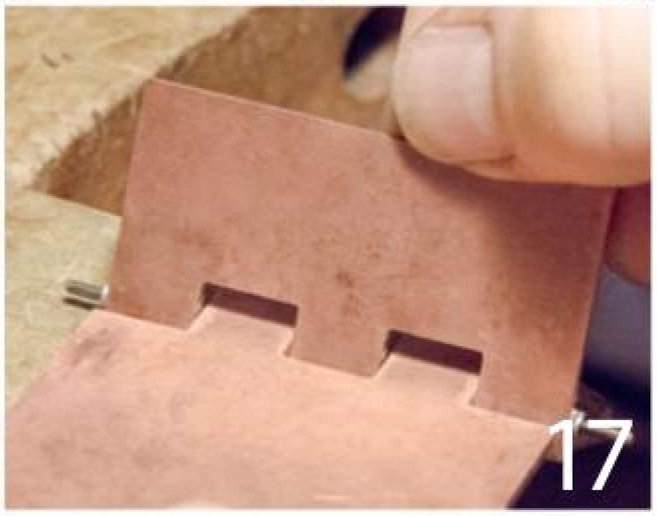
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Process photos and illustrations by Tom Muir.

The deeper you filed the channel for the tubing, the shallower the angle of backfiling that will be needed to open your hinge. It's best to file at a shallow angle first, align the two pieces with an alignment pin, and check to see if your hinge will open upward. If not, file the angle another 5° steeper, and recheck.

Repeat until your hinge opens properly **[17]**. (See "Stop the Hinge," *opposite page*, if you want to stop your hinge from opening beyond a certain point.)

Set the hinge pin. Finish your hinge as needed for your design. The final step in the assembly of your piece is to set your hinge pin. It is usually not necessary to hammer the ends of the pin to secure it, as the hinge pin should be an extremely tight fit; however, you may choose to do this in order to fit the design or function of your piece.

Inevitably, every hinge will eventually need to be repaired, and it is easier to make a final hinge pin that allows it to be removed when needed. I prefer a tight-fitting hinge pin that holds itself in place by the tension of a perfect fit. While a tension-fit hinge pin won't work for all types of hinges, the length of the tubing on an integral hinge usually accommodates it. (See "Hinge-pin Options," *right*, for hinge-pin and knuckle-preparation options.)

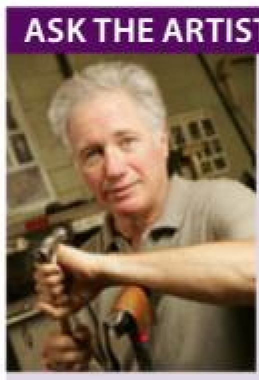
See more work with integral hinges by Tom Muir, his students, and his colleagues at **www.artjewelrymag.com/reference**.

hinge-pin options

There are many ways you can construct and set your hinge pin so that it suits your design and is easily removable for repairs. Here are a few techniques to choose from:

- Use solid, snug-fitting wire or tubing for the hinge pin. Use tension or flare the ends, as when setting rivets.
- I sometimes prefer stainless-steel hypodermic tubing for the hinge pin, as its strength allows me to use a thinner outside diameter (OD), it's safe to place in pickle, and it won't rust when it comes into contact with water.
- Use a tapered reamer (cutting broach) on the inside of thick-walled tubing to create a gentle taper, and then gently tap a matching-taper hinge pin into the tubing. When needed, tap the pin back out from the opposite end from which you drove it in.
- If necessary, apply a very slight bow to your hinge pin to help create more tension. This bow, if needed at all, should barely be perceptible to your eye.

ASK THE ARTIST: TOM MUIR



What's on your workbench right now?

"I'm currently making a series of belt buckles that combine elements of popular culture with my ongoing interest in innovative representation of natural forms, using both traditional and digital techniques. The belt buckle format is a popular item of men's jewelry, often signaling the wearer's seriousness about hunting or fishing with representations of animal trophies, such as grizzly bears or trout. These buckles, depicting the snouts of animals such as hogs and star-nosed moles, are both humorous and evocative of rural America. These popular and local references are transformed through formal rendering of the snout shapes, revealing their mix of elegance, grotesquerie, and mysteriousness."

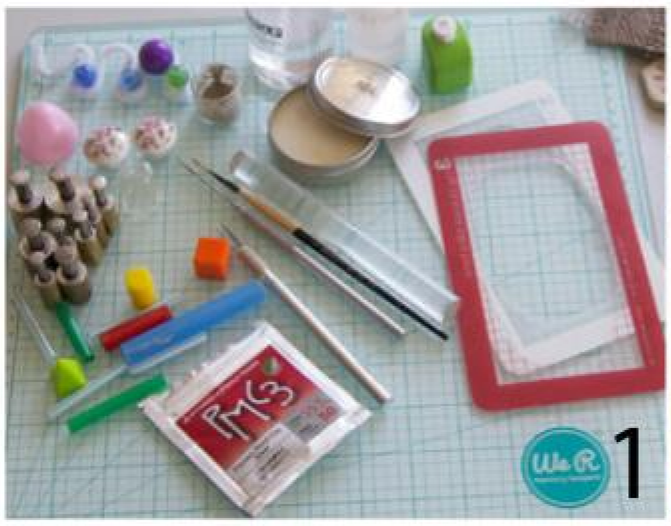
Contact: tmuir@bgsu.edu

BUILD A COLLECTION OF Metal-clay Charms

Take an assembly-line approach to making a series of one-of-a-kind pieces.

by Lynn Cobb

To borrow from the rock and jazz music worlds, I love to "riff" on an idea or design. Sometimes, my ideas for a series are thought out ahead of time, but often, a new piece will be so exciting, I'll start making another … and another … with variations almost before completing the first one! Not only do I get to explore design concepts and perfect the construction techniques required, but I also end up with a ready supply of miniature elements for "Necklace-a-day" pendants, charm bracelets, and earrings that are related in theme. Whether you decide to create a village of castles and huts of your own, or riff on another design, this article will help you to begin to work in series.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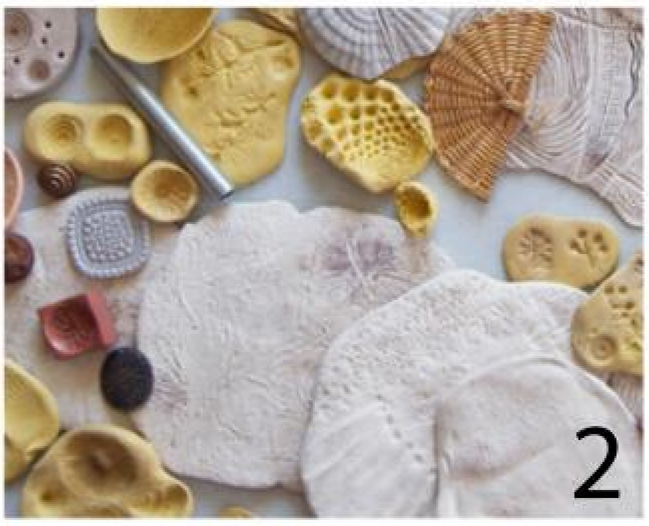
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materials

- Fine-silver metal clay:
  - Lump clay: 25–50 g
  - 1 syringe
- Gold metal clay: 1–2 g

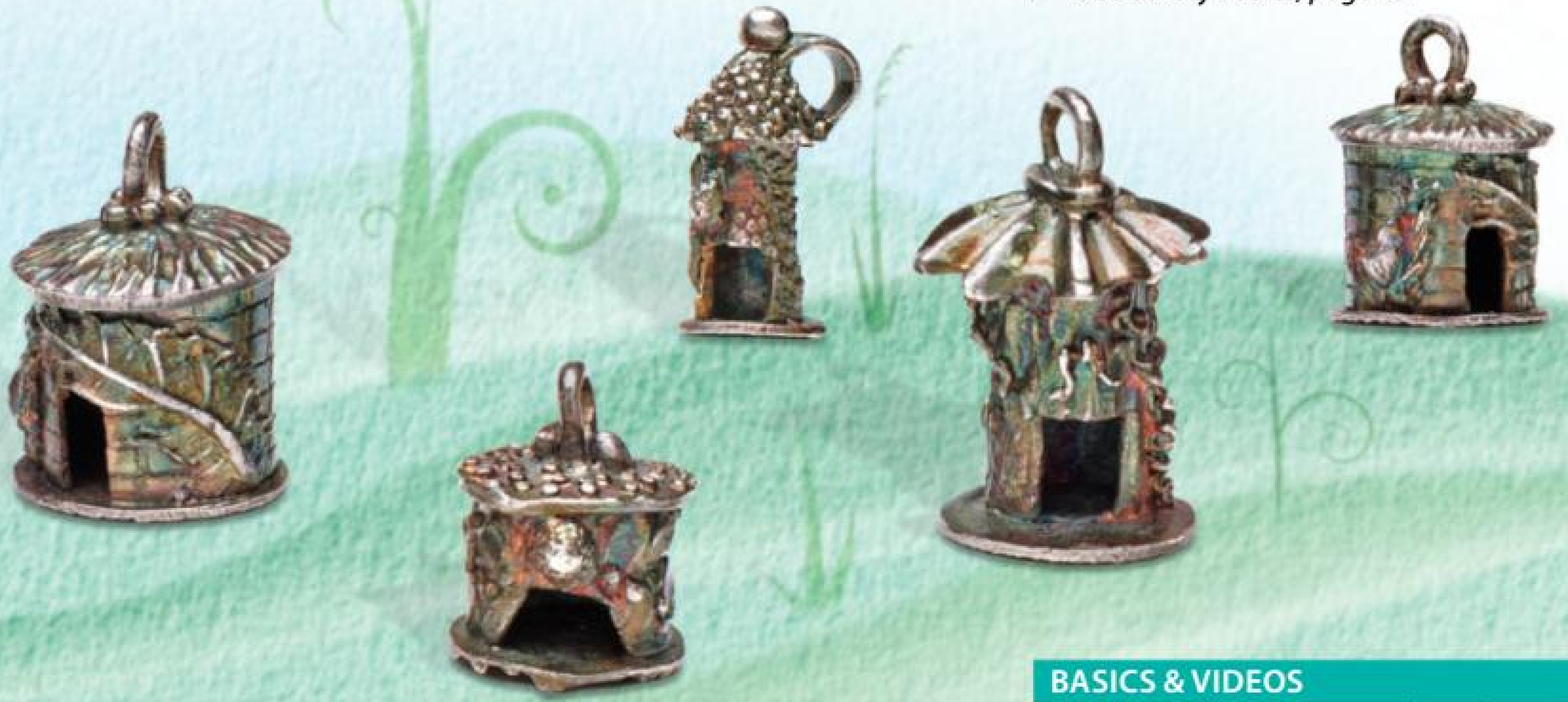
toolbox, page 76

- Metal clay

additional tools & supplies

- Assorted doming forms
- Plastic sanding needles and sanding papers
- Liver of sulfur
- Distilled water
- Nail polish
- Small sponge
- Small bowl

Find out where to buy supplies, *page 79*
See Safety Basics, *page 76*



The key to streamlining the construction process is that each charm has essentially the same four elements: walls, roof, floor, and bail. Work your way through the steps to create multiple walls at a time, then multiple roofs, etc. The secret to keeping the charms distinct and original is to mix up dimensions, textures, and forms. Vary the height or diameter of the walls, the slope of the roofs, the number and placement of doors and windows, etc. By the time you finish your series, you'll have a firm grasp on the technical process of texturing, cutting, molding, forming, and assembling — all the benefits of a repetitive sequence, without a series of identical pieces.

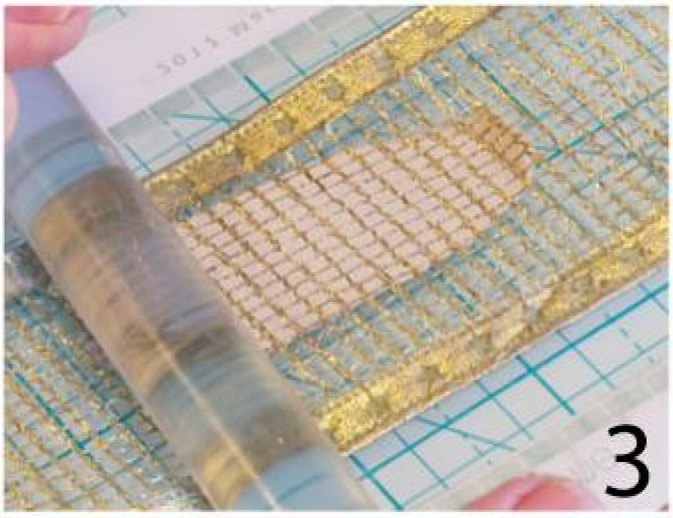
Prepare your work area. Because metal clay dries out, gather your tools and prepare your work area before unwrapping your clay. Assemble a variety of tools and armatures for drying your clay upon, including straws and other circular forms in various sizes **[1]**. Shape cutters serve double duty — as well as their intended purpose, you can also wrap strips of clay around them to create the charms' walls.

Gather texturing materials for the walls that will convey an aged look. I use my own carvings, old buttons, and textures I reproduced from plants and shells using a two-part silicone mold. Also gather textures that will be whimsical roofing possibilities **[2]**.

BASICS & VIDEOS

Learn fundamental techniques in these bonus tutorials:	B	🎥	
Rolling & cutting metal clay	●	●	
Texturing metal clay	●	●	
Liver of sulfur patina	●		Art+
How to use shape cutters			Art+
Polishing metal using a tumbler	●	●	
Drilling a hole in metal clay			Art+
Making a silicone mold		●	

B Basics, *page 73*
🎥 Videos, www.artjewelrymag.com/videos
Art+ Subscriber videos, www.artjewelrymag.com/subvideos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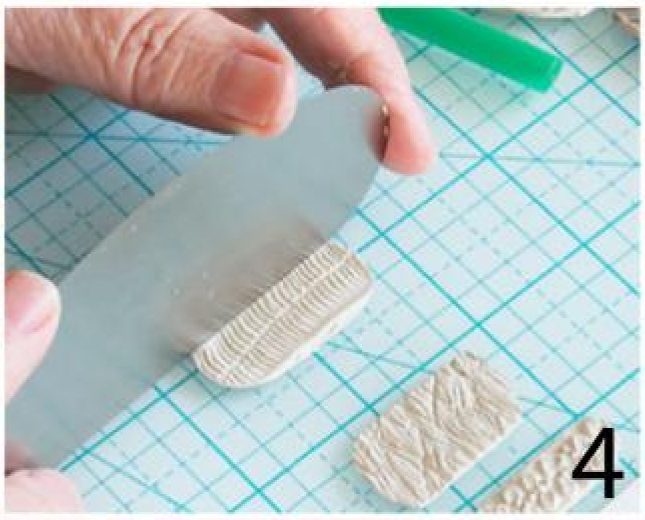
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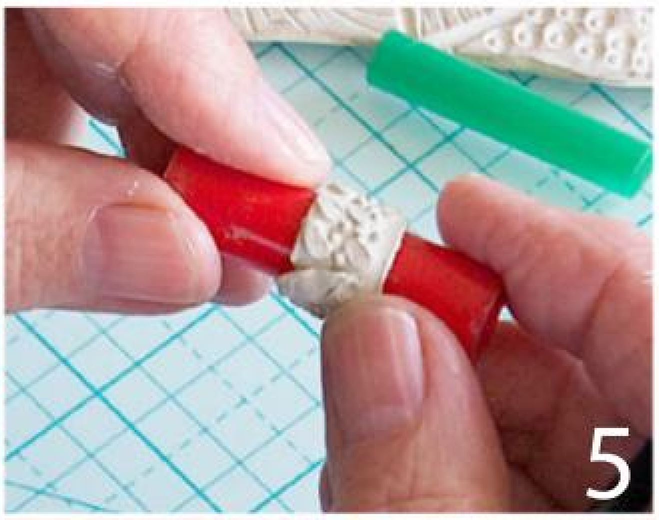
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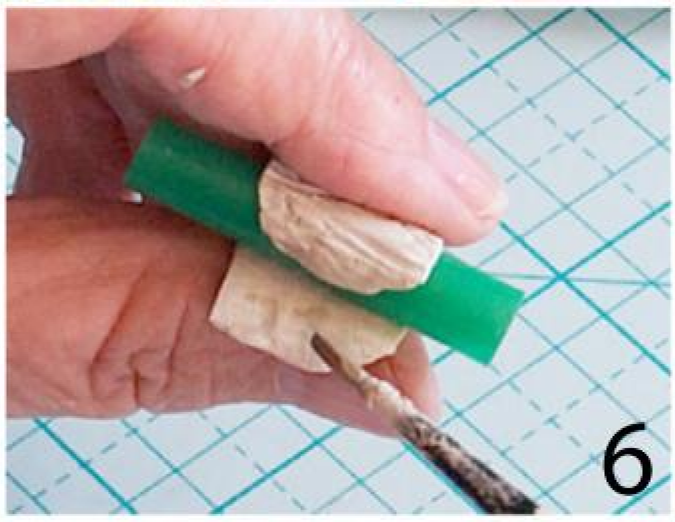
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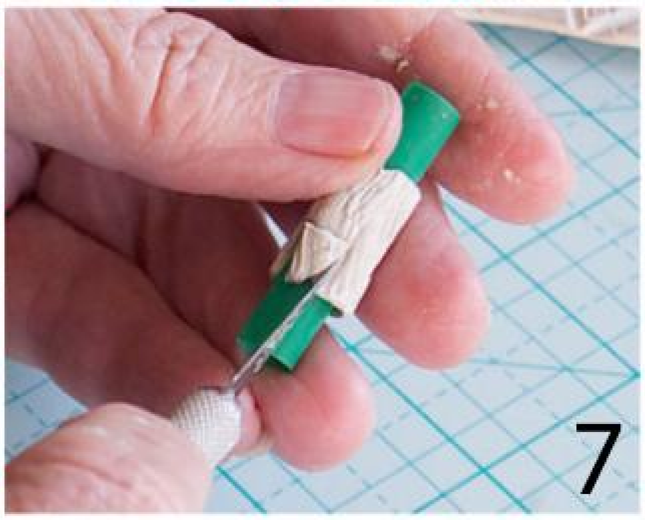
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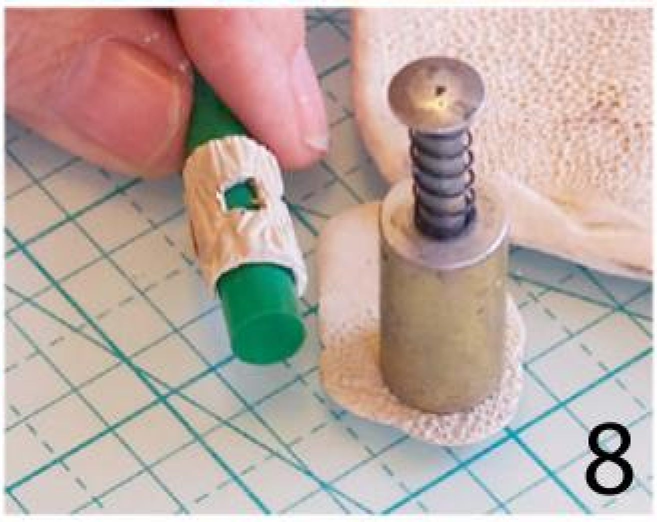
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Roll out the clay for the walls. Apply olive oil or another non-petroleum-based lubricant to your texture sheets, an acrylic roller, and your rolling surface. Then unwrap your clay.

Roll out clay on each of your selected textures to make 7–10 different walls **[3]**. The walls should be no more than about 1 in. (25.5 mm) wide for small charms.

NOTE: The thickness of the rolled-out clay is up to you and your design. I've found for such small charms (the largest is 1¼ in./ 32 mm tall), it is possible to roll the clay as thin as #2–3 (2–3 playing cards thick) on a standard thickness guide. In some cases, you'll want thicker clay; see "Simple Wet Etching," *page 66,* for an example.

Wrap your remaining metal clay in plastic wrap to keep it from drying out, and set it aside.

Create the wall elements. Cut the rolled-out clay into rectangular strips with a variety of heights **[4]**. (The short side of the rectangle determines the height of the charms.) Add the scrap clay to the clay you have set aside.

Wrap each strip around a straw or other round, square, or pyramid form.

NOTE: For tall turrets and silos, a standard straw works well. For short barns and yurts, use fat straws **[5]**. For a tepee, use a cone shape; for a square building, use a block.

Press one end of the strip to the straw or other armature. Wrap the strip around the armature, and overlap the beginning of the strip. Use a wet fine-tip paintbrush to dampen both ends of the clay where they overlap **[6]**, and trim the edges to make a smooth connection. Press to establish a bond, but not so firmly that you distort the texture.

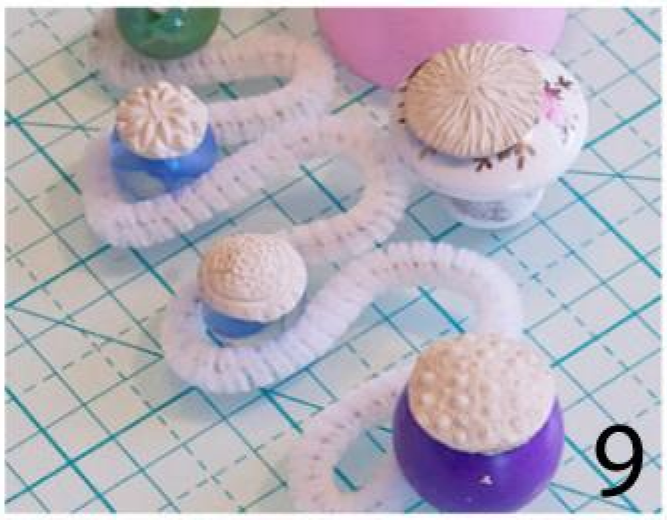
Cut doors and windows. While the clay is still wet, use a craft knife to cut doors and windows **[7]**. Set the wall elements aside to dry completely (See "Metal Clay Dryness" chart, *opposite page*).

Texture the roofs. Unwrap your reserved clay, and roll it out on a variety of textures that will complement your wall elements.

working with gold clay

Gold metal clay is not as frequently used as the silver and base-metal clays, for one very good reason — it's expensive! But a splash of gold can add a lot to a collection of silver charms, especially when you vary the silver finish with patinas. When working with gold clay, make your gold piece the smallest of the series, and consider cutouts. Adding lots of windows and doorways to my little gold charm allowed me to save clay.

Actual size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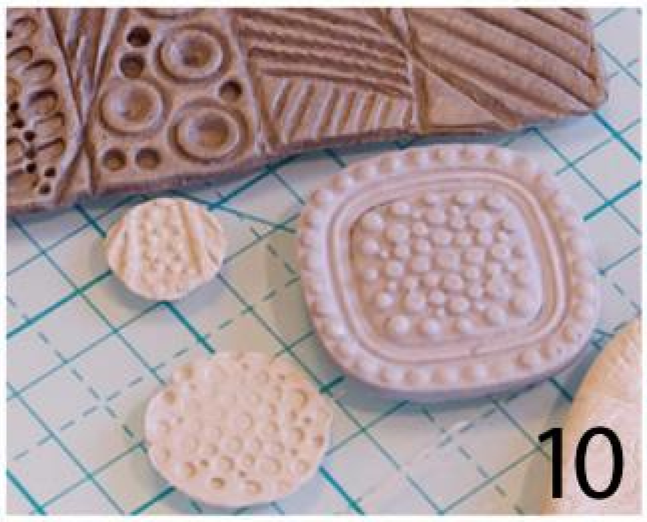
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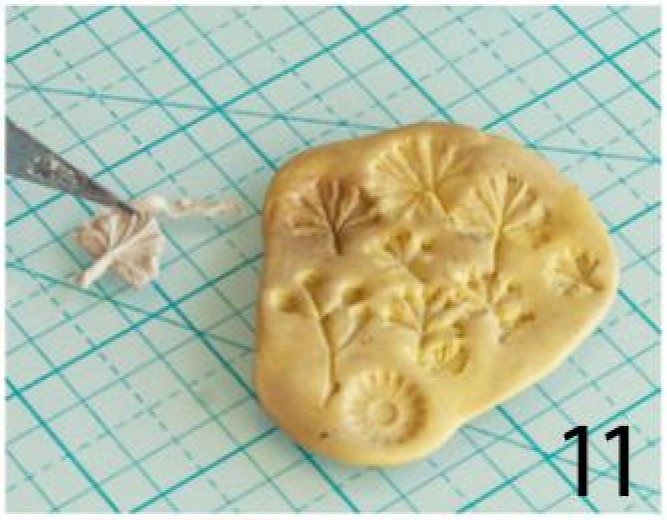
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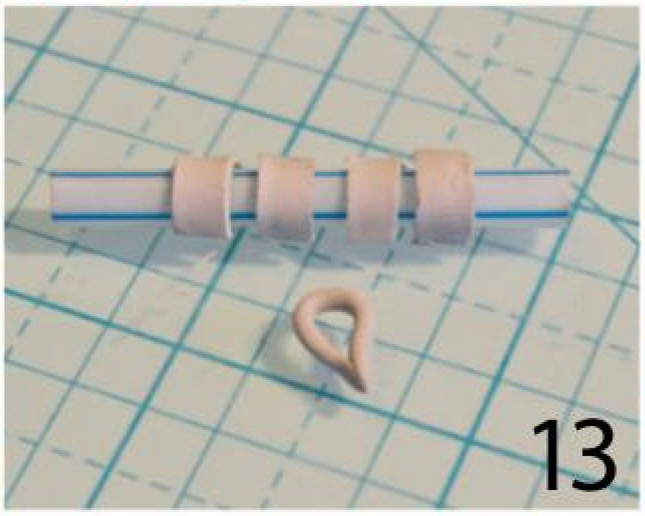
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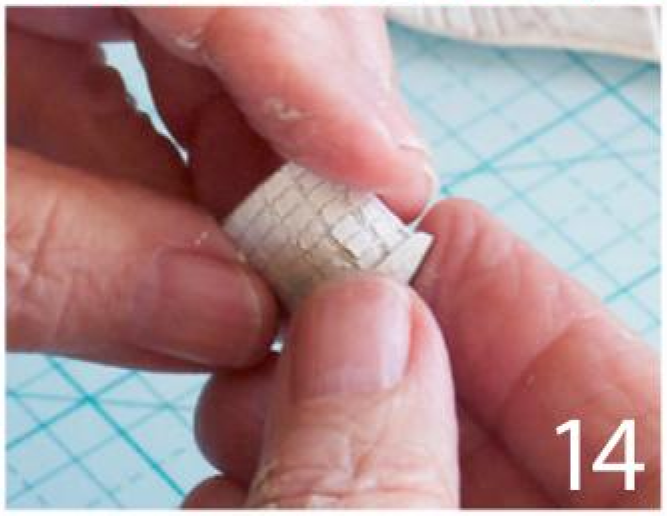
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The roofs will hold the bails, so should be at least #3, for strength.

For a simple roof, use a round cutter to cut out a disk that is larger than the diameter of the wall element you'll match it to **[8]**. Set each roof on a rounded form to give it a domed shape **[9]**. (For fun roof options, see "Raising the Roof," *right*.) As you cut your roofs, remember to wrap your unused clay to keep it moist.

Lay the floors. For the floor of each charm, roll out your remaining clay to #2, texture it, and then cut disks of various sizes out of the textured clay **[10]**.

Cut embellishments and bails. To add decoration, press wet clay into leaf-shaped molds, and then use a craft knife to trim the leaves **[11]**. Set all the components aside to dry completely **[12]**.

For the bails, roll out wet clay to #3. Cut the rolled-out clay into strips and wrap them around small straws to form loops. Use a wet, fine-tip paintbrush to create a bond where the clay overlaps. You can create other styles of bail: For one, form a strip of clay around a straw into a J-shape. For another, roll clay into a coil and press the ends together. (To use the coil-style bail, you'll need to drill a hole in the center of the corresponding roof.) Set the bails aside to dry completely **[13]**.

Assemble the houses. Choose a roof and a wall element. Check the fit of the roof against the wall. If necessary, use plastic sanding needles or sanding papers to refine the edges so that they fit flush. Use the paintbrush to dampen both pieces where they will join, and connect the two components **[14]**.

As my series is based on medieval castles, I assembled them roughly, to give them an aged look (though I did sand them well to smooth the edges). You may want to assemble more modern buildings more precisely.

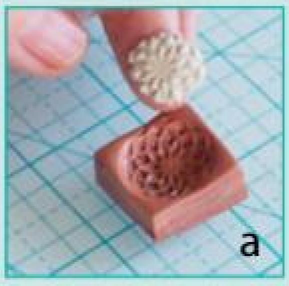
TIP: When joining wet clay to dry clay, first dampen the dry piece at the joining location. When joining two dry pieces, first dampen both pieces. Then, wiggle the pieces together until you feel them "grab."

Metal Clay Dryness

Wet	A lot of moisture; very pliable
Semi-dry	Some moisture; firm, holds its shape
Mostly dry	Nearly devoid of moisture; rigid
Completely dry	No moisture; can be fired

raising the roof

Keep your eyes and mind open when it comes to making roofs for your charms. You can, of course, get some great textures from texture sheets. Other options are to make a mold of a domed vintage button, and use the mold for your roof **[a]**. Not only will this give you a great texture, but it also saves you a step later, as the clay will naturally dome when you press it into the mold. One of my favorite tricks is to mold Romanesco broccoli, and use that mold to create a taller, turret-style roof **[b]**. It's a great texture, and it's highly distinctive.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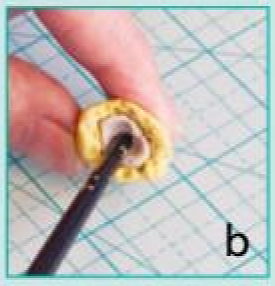
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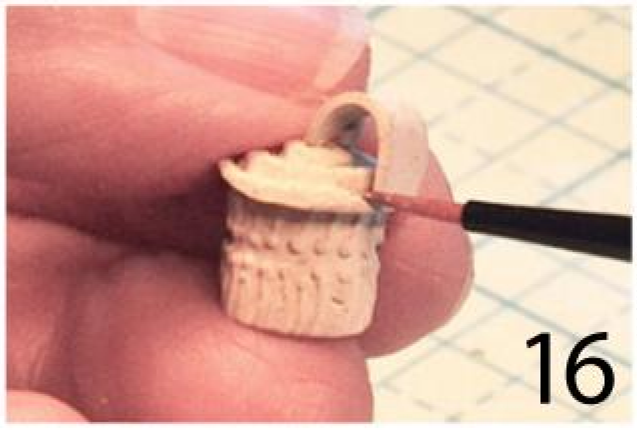
Learn how to use a two-part silicone mold to create your own textures at **www.artjewelrymag.com/videos**.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Process photos by Andrew Stevenson.

After adding the roof pieces, add the round bails in the same way: First dampen both pieces with a wet paintbrush, then join them.

NOTE: To add a coiled bail, apply syringe clay to the hole in the roof, and insert the end of the bail into the hole. To attach a J-shaped bail (which connects at the top and back of the charm), first complete the entire building, then fit the bail to the charm, filing and sanding as necessary, then attach it **[16].** Use syringe clay inside the bail to reinforce the join between the bail and the charm.

Set the assembly aside to dry completely. Repeat to join all of the roof, floor, and landscaping components. Allow each piece to dry completely after adding each element. (This is where the assembly-line approach comes in handy; while one assembly dries, move on to the next.)

When the charms are dry, use sanding needles and sanding papers to refine the edges and clean up any messy seams.

Embellish the charms. Add any additional decorations, such as syringe designs, little balls, or cutouts. You can add these around the bails to add extra anchorage that is also visually pleasing.

Refine and fire the charms. Smooth and sand any rough edges, and then fire the charms according to your clay manufacturer's instructions. Finish them as desired — with a brass brush, tumbler, burnisher, or patina.

TIP: Work a pipe cleaner into the interior of hollow pieces before before tumbling them. This will prevent them from filling up with shot, which can be extremely difficult to extricate.

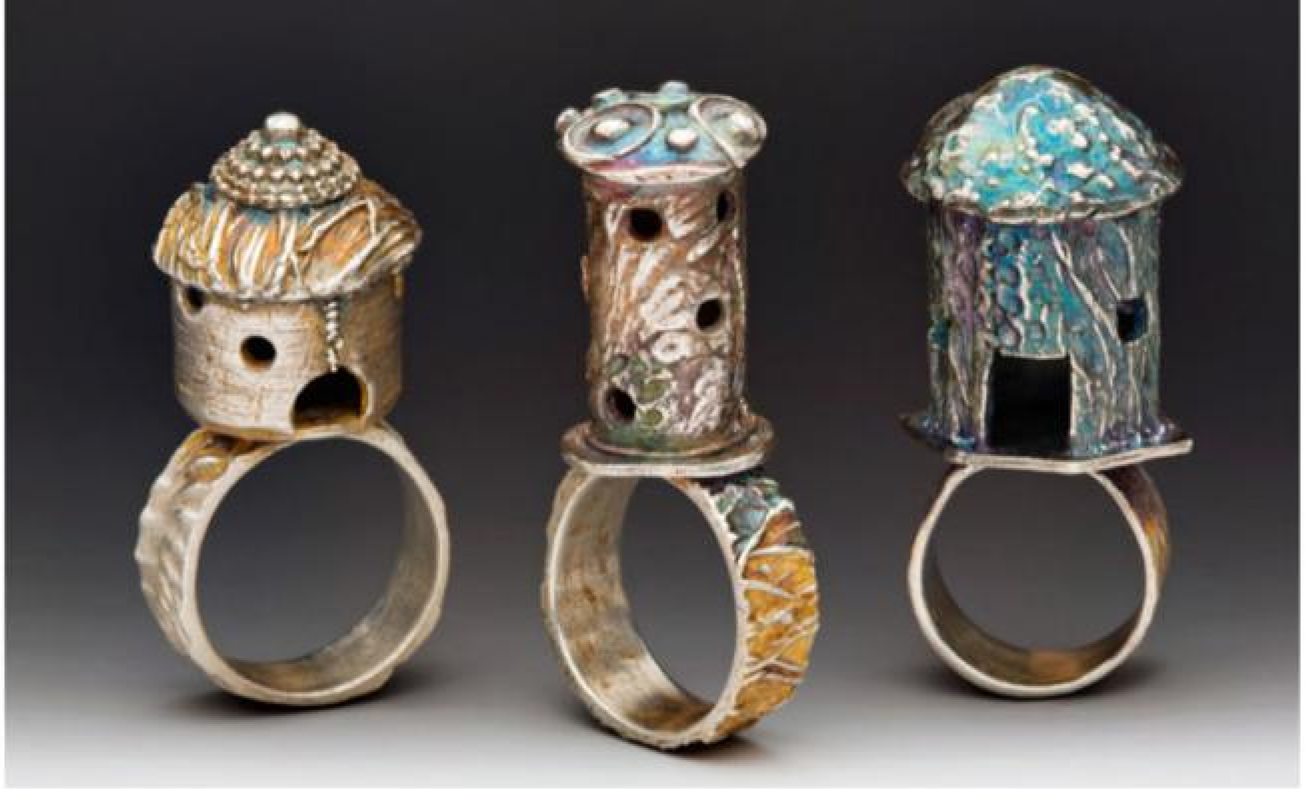
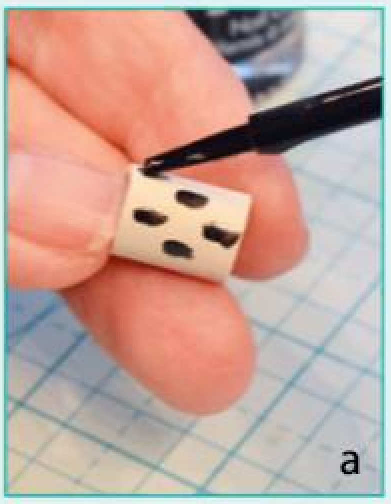


Photo by George Post.

Instead of adding a bail, try adding a shank, and wear your castle on your finger!

simple wet etching

If you want to create an original texture, wet etching can be an option. For this technique, roll the wall element to at least #4 (4 cards thick) — the deeper you want your finished texture to be, the thicker your original clay sheet should be. Form the wall element, and allow it to dry completely. Use nail polish to paint a pattern on the clay **[a]**. The polish will be the resist; once you're done, where the polish is will be the raised portion of your texture.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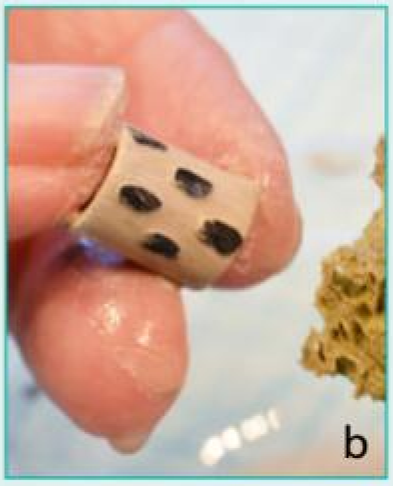
Use a wet sponge to carefully wipe over the piece, allowing the clay-laden water to drip into a bowl **[b]**. Work slowly, and examine the piece after each pass with the sponge; you don't want the entire structure to go soft. After a few passes, set the piece aside to dry completely. Then, repeat the process of wiping away clay with the wet sponge. You'll need to repeatedly allow the piece to dry completely between passes with the sponge so that the piece does not soften too much and collapse. Continue until you've reached the desired depth, then finish assembling the charm, and fire it. Be sure that you're working in a well-ventilated area; the nail polish will burn away in the kiln, leaving the raised texture in its place.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ASK THE ARTIST: LYNN COBB

What is on your workbench right now?

"I am finally gathering the first 10 projects for the first level of the Metal Clay Master's Registry. Six are completed, two are in progress, and two are confounding and still in the design phase. The Registry was formed as a way of recognizing professional development and proficiency in metal clay. There are 50 projects, divided into five levels, which are judged on such criteria as innovation, technical expertise, and design. I finally have the time to dive in and focus on these specific projects!"
Contact: www.etsy.com/shop/lynncobb

WETO
PRODU
Paper A wt
P400

Data Sheet: Sanding

In the process of refining your work, sanding comes after filing. Many tool lists call for "sandpaper" (*Art Jewelry* magazine's included) while some refer to "abrasive paper." The terms are largely interchangeable; "abrasive paper" has been adopted as the more technically accurate term, since the abrasive used isn't actually *sand*, but old habits die hard, and "sandpaper" is still predominantly used.

Common types of abrasives include: silicon carbide, emery/aluminum oxide, cerium oxide, and diamond.

Use sandpaper to remove scratches and marks. As with all finishing processes, begin with the coarsest grit needed, and work through progressively finer grits until you reach your desired finish, alternating your sanding direction with each change in grit. It's common to start with 180-, 220-, 320-, 400-, and 600-grit wet/dry sandpaper, followed by polishing papers up to 2000-grit.

Grit: What is It?

"Grit" refers to the size of the abrasive particles on an abrasive paper, cloth, wheel, or disk. Typical abrasives used in jewelry making are 180–2000-grit, but coarser and finer grits are available. Each sheet of sandpaper has no particles coarser than the labeled grit, but it can, and does, include finer particles.

- Low number = coarser
- High number = finer

Ex: 320-grit is much more coarse than 1000-grit.

Unlike common sandpapers, micron-graded abrasives have particles of uniform size. Micron-graded papers are often listed as "coarse," "medium," "fine," and "very fine" instead of given a definite number designation. Check with the individual manufacturer to determine what grits are comparable. Again, these numbering systems are not universal: Choose one brand and follow their guide.

Grit is also used for grading abrasive wheels, disks, etc., for use in a flex shaft or rotary tool.

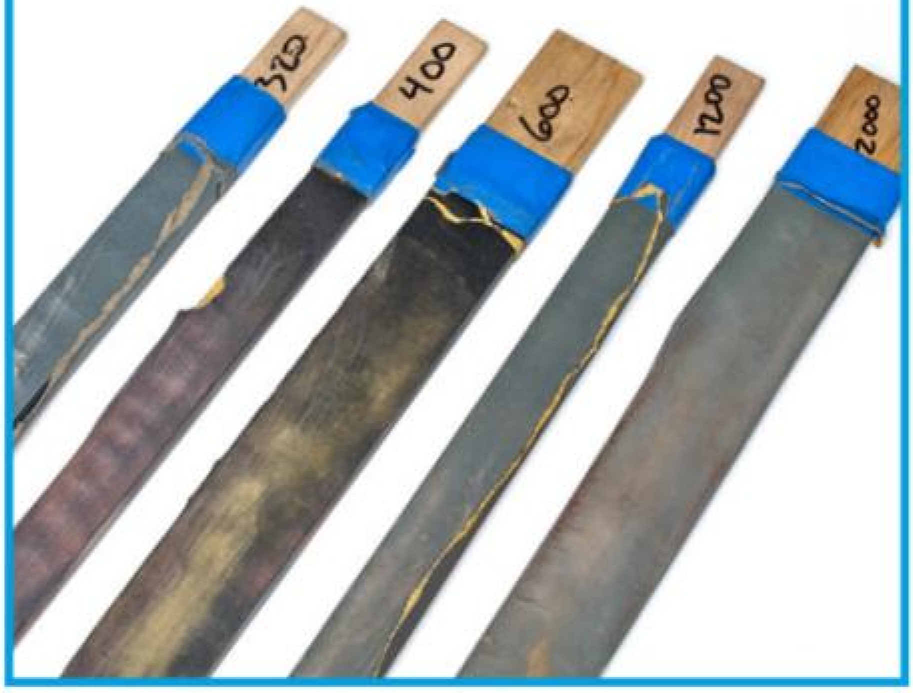
make a sanding stick

Place a sheet of sandpaper face-up on your work surface. Cut two 12-in. (30.5 cm) strips of tape (masking or painters). Center a tape strip on each long edge of the sandpaper so that only half the width of the tape adheres to the sandpaper and roughly ½ in. (13 mm) of tape extends at each end.

Turn the sandpaper grit-side down. Place a sturdy flat wooden stick (a paint stirrer works well) against one short edge of the sandpaper. Align an end of the stick with a taped edge of the sandpaper. The other end of the stick should extend past the other taped edge; the extending end will be the handle.

Wrap the tape ends around the stick. Use a scribe to score a line on the sandpaper along the stick's edge. Rotate the stick one-quarter turn, creasing the sandpaper at the scored line. Score the paper as before, and then rotate the stick another one-quarter turn. Press the tape firmly against the stick at each rotation.

Repeat scoring and turning until you have wrapped the entire sheet of sandpaper around the stick. Wrap the tape ends around the stick. Use a permanent marker to mark the grit on the handle. As you use the sanding stick, the sandpaper will become clogged; simply tear off a layer to expose fresh sandpaper.



Grits most commonly used by jewelry makers

80 120 150 180 220 240 320 400 600 800 1000 1200 1500 2000 4000 6000 8000

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DESIGN
CHALLENGE

January 2014
Theme: Industrial
Winner: Scott Janiak-Ross

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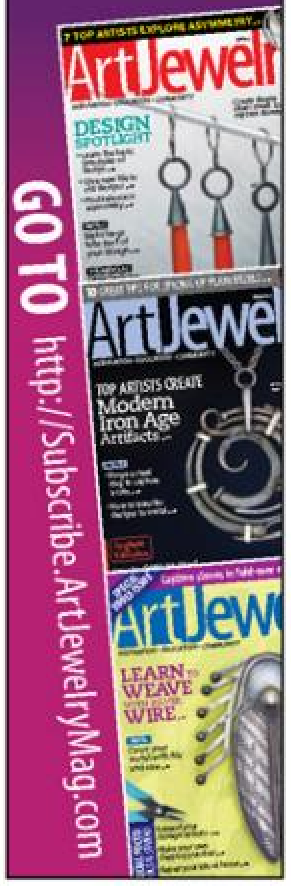

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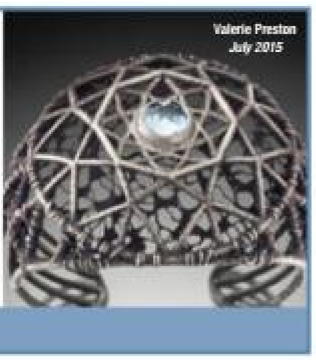
Valerie Preston
July 2015

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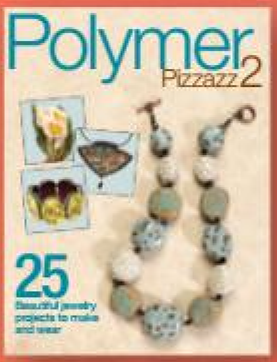
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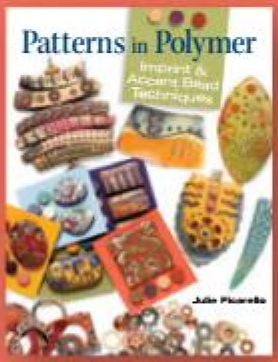
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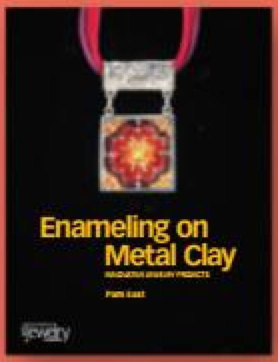
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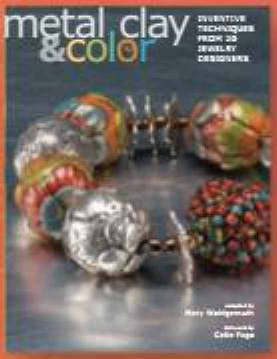
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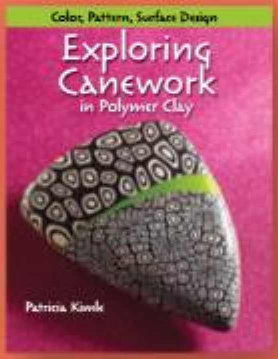
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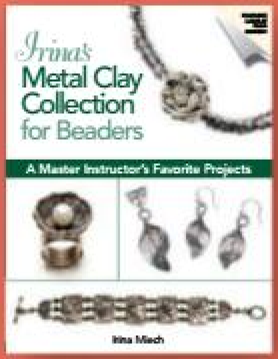
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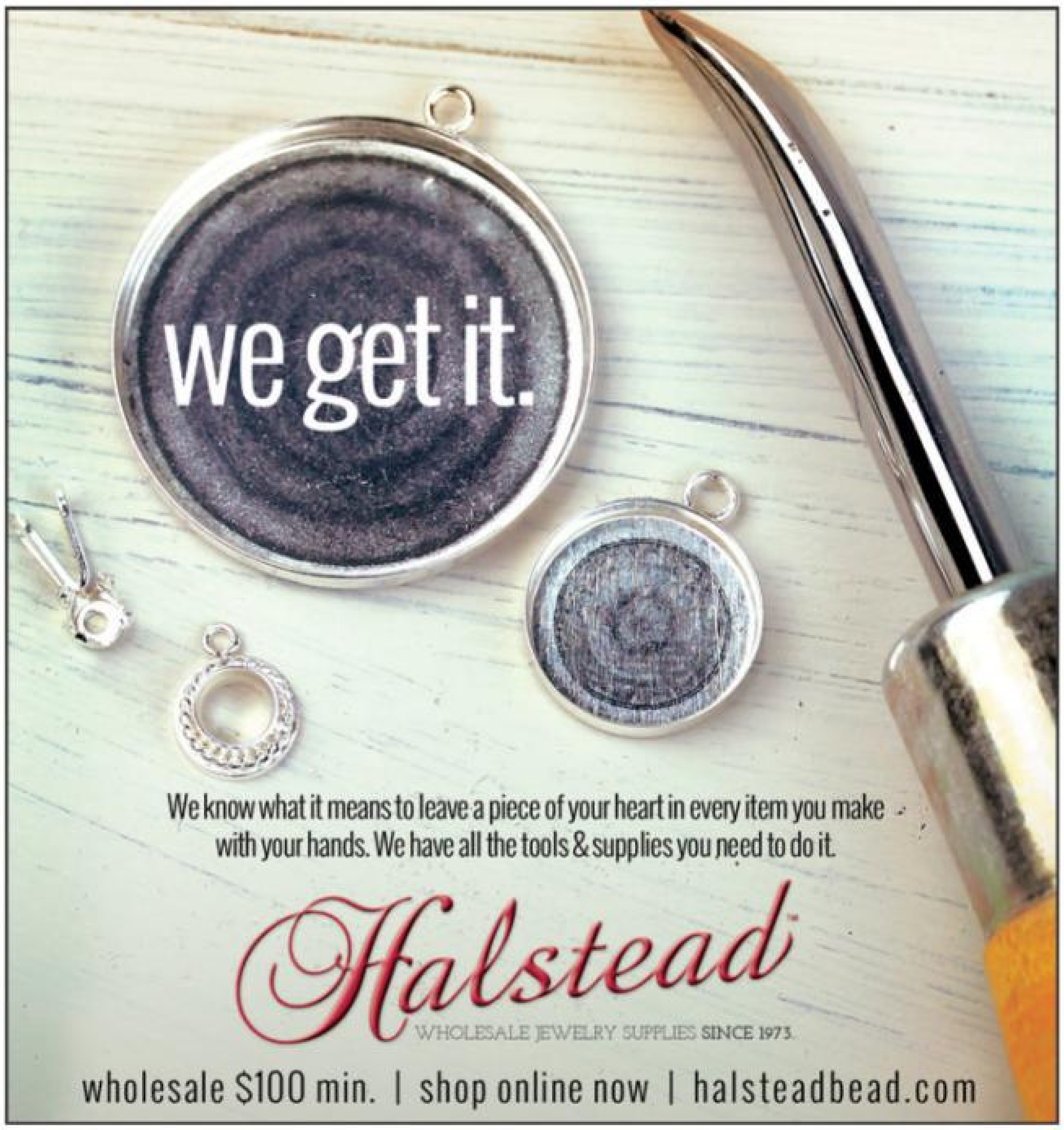

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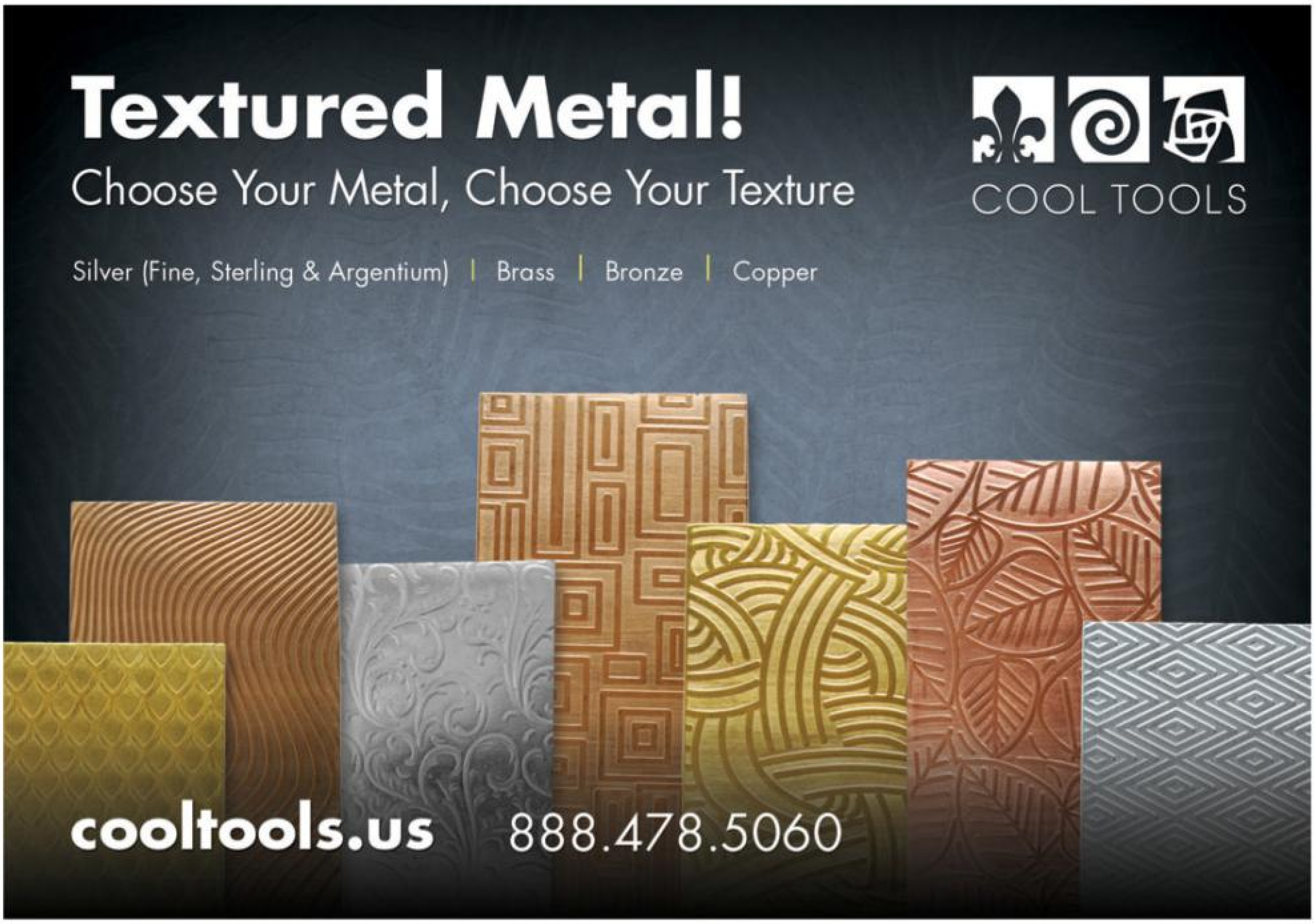

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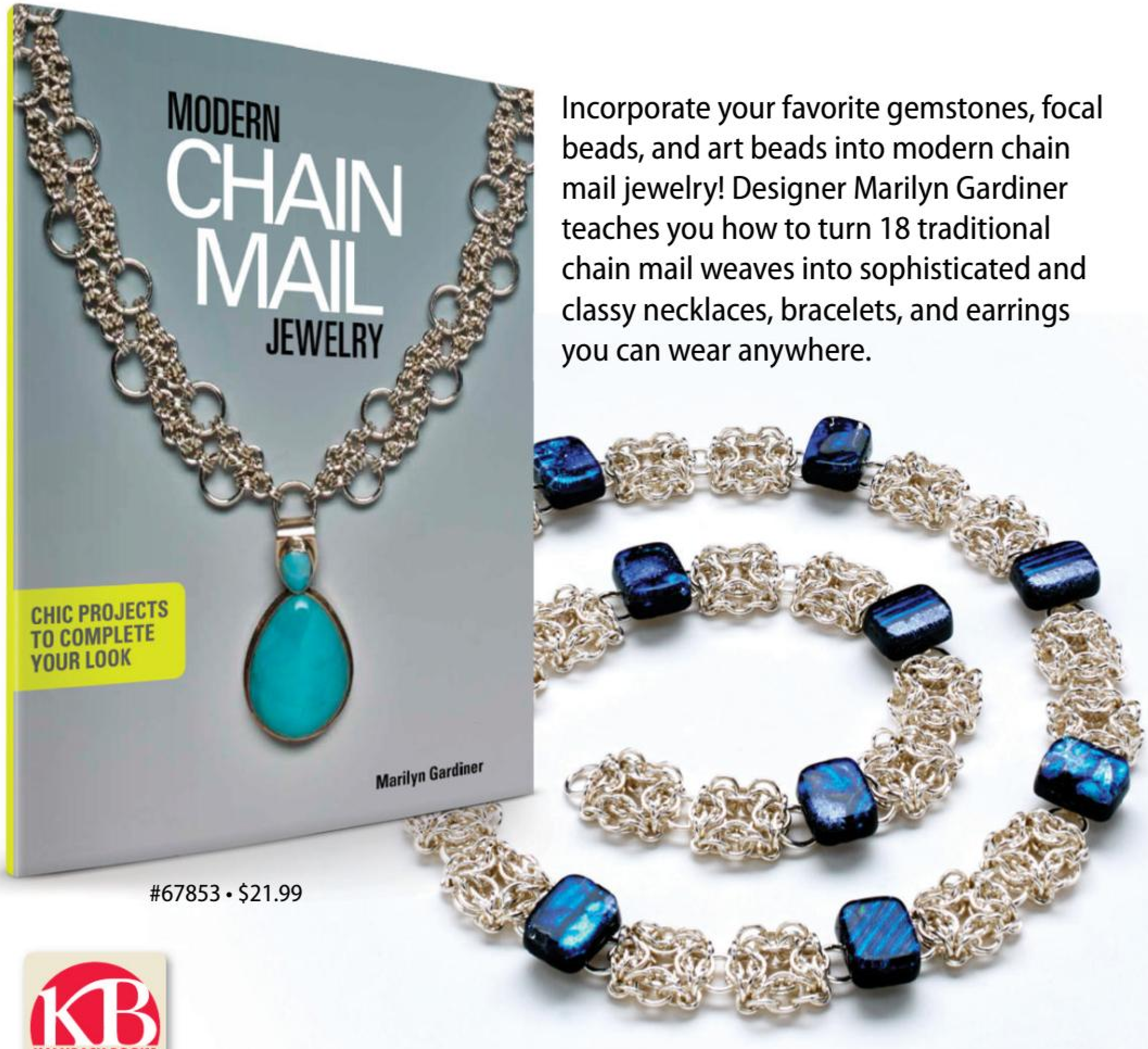
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No matter what medium you work in, there are some jewelry-making techniques that are so essential, you'll use them in nearly every project you make. These tutorials will walk you through the beginner techniques that you'll need to learn in order to make the projects in this issue.

metalworking techniques

DRILLING

Place your metal on a steel bench block or anvil. Use a center punch and a mallet to create a dimple where you want to drill a hole, or in the section of the metal you want to remove (for piercing) **[Figure 1]**. Place the metal on a piece of wood and use a flex shaft or other rotary tool and a drill bit to drill a hole at the dimple **[Figure 2]**.

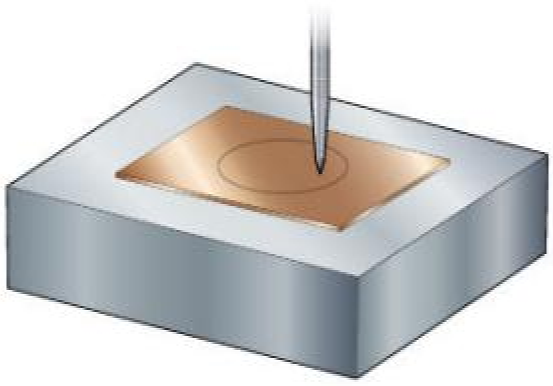

Figure 1

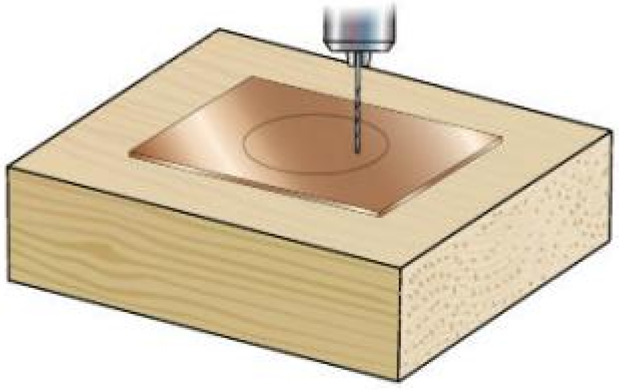

Figure 2

See these FREE videos at www.artjewelrymag.com/videos!

- **Piercing metal**
- **Pickle basics**
- **Annealing metal**
- **Polishing metal using a tumbler**
- **Sweat soldering**
- **Rolling & cutting metal clay**
- **Texturing metal clay**
- **Making jump rings**
- **How to coil wire**
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- **Balling the end of wire**

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- **Drilling through metal**
- **Basic sawing of metal**
- **Liver of sulfur patina**
- **How to coil wire, extended version**
- **How to cut jump rings with a jeweler's saw, extended version**

SAWING/PIERCING

Select a saw blade that is the correct size for the gauge (thickness) of metal that you are going to cut.

To thread a saw blade, insert the blade with the teeth of the blade facing down and out, away from the frame, into the top wing nut of the saw frame. Tighten the wing nut. Brace the handle in the hollow of your shoulder, and apply pressure to the saw frame against your bench pin. Maintaining pressure, insert the bottom of the blade into the wing nut closest to the handle, and tighten the wing nut **[Figure 1]**.

The blade should be taut and should make a high-pitched "ping" sound when you pluck it with your thumbnail. If you get a dull "twang" instead, reinstall your blade while putting pressure on the saw frame. Then, lubricate the blade.

When sawing, maintain an erect posture with the top of your workbench at upper chest level. Slouching or having your work too low causes back and wrist strain and leads to broken blades.

To saw, grip the saw frame loosely. Use long, smooth motions, use as much of the blade as possible, and keep it perpendicular to the metal **[Figure 2]**. Putting excessive pressure on the saw frame will make you work harder. Turn corners by sawing in place while slowly turning the metal; turning the saw without cutting clearance at the corner will break the blade.

To pierce metal, drill a hole inside the area you want to cut out. Remove one end of the saw blade from the saw frame. Slide the blade through the drilled hole, then reinsert the blade into the frame, and tighten it. Saw out — or pierce — the inside section of the metal. Release one end of the saw blade from the frame so you can remove the blade from the metal.

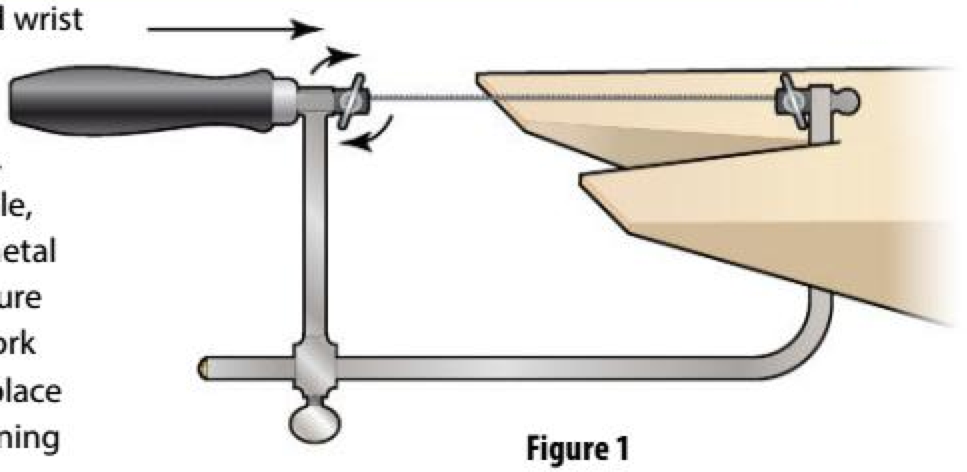


Figure 1

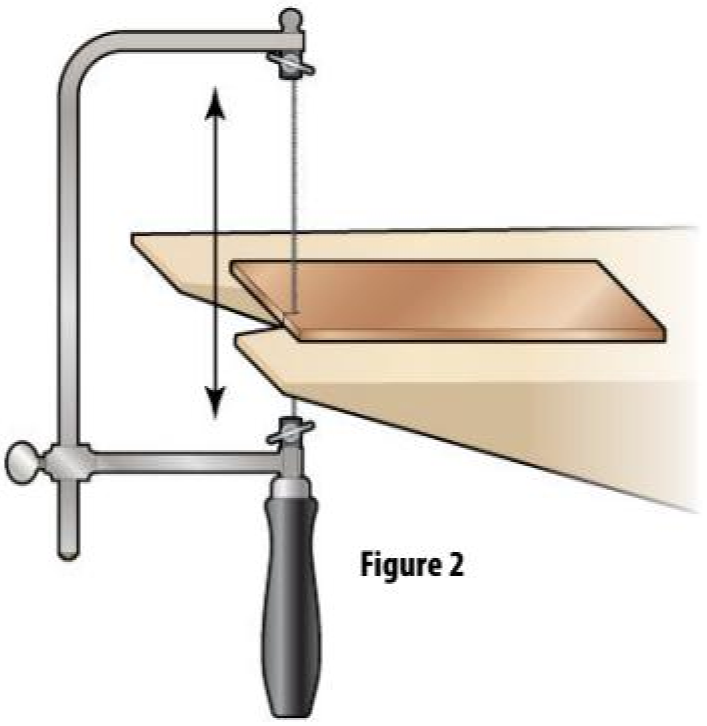


Figure 2

Download a FREE "Metal Piercing Chart" to help you choose the best saw blade and drill bit size for your project. Visit **www.artjewelrymag.com/reference**.

SOLDERING

Clean the metal you plan to solder by sanding it with 400-grit sandpaper. Solder won't fill gaps; surfaces must be clean and in complete contact with each other for solder to flow. Apply flux to the metal to prevent oxidation and to help solder flow. Heat the entire piece evenly, not just the solder, and keep the torch moving in a circular motion.

If there is more than one solder join in a piece, solder the first using hard solder, the second using medium solder, and the third using easy solder, as hard solder has the highest melting point and easy solder has the lowest. To keep the solder in previous joins from flowing when you heat the metal again, apply an anti-flux to those areas.

During soldering, the solder will flow toward where the heat is the greatest. If your solder is flowing in the wrong direction, adjust the direction of your flame.

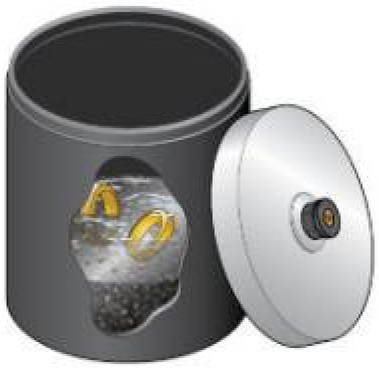
Once the solder flows, quench the piece in water. Then, place it in a pickle solution to remove oxidation and flux residue. Rinse the piece in clean water.

SANDING

To give your metal the desired finish, smooth the surface and edges by sanding with progressively finer grits of sandpaper. Begin with a coarse grit (220–400) and work up to a fine grit (600–1000). Rub each grit of sandpaper back and forth in one direction. When you switch to the next finer grit, rub the sandpaper perpendicular to the marks from the previous grit until you can no longer see them.

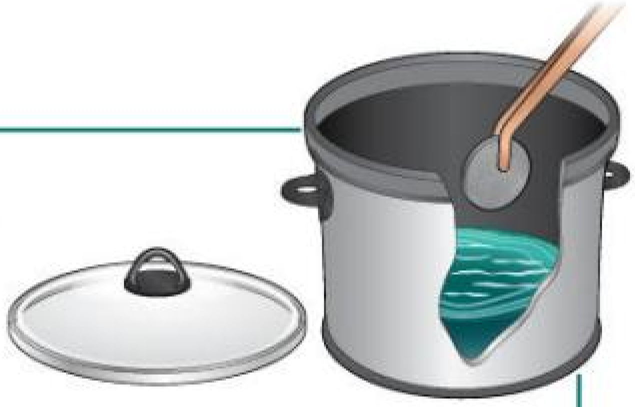
POLISHING METAL USING A TUMBLER

Place steel shot into the tumbler's barrel. Although you can use any shape of steel shot, a combination of shapes works best; the various shapes polish crevices and contours differently, ensuring an even polish.



Pour in water to cover the shot, then add a pinch of burnishing compound. Place your jewelry in the tumbler and seal the barrel. Turn on the tumbler, and let it run for 2–3 hours or more. Pour the contents of the tumbler into a sieve over a sink, and rinse. Remove your jewelry and dry it. Dry the shot before storing it.

PICKLE



Pickle is a mildly acidic solution that cleans oxides from metal by removing small amounts of copper. Pickle is generally sold in powdered form and is available from jewelry supply companies. To make pickle, follow the manufacturer's instructions to mix the powder with water in a pickle pot dedicated to non-food use.

If steel (binding wire or tweezers) comes in contact with used pickle, it can cause a chemical reaction that will copper-plate whatever metal is in your solution. To prevent this, use copper or plastic tongs to place metal in the solution.

ANNEALING

Annealing restores malleability to work-hardened metal. Place the metal on a soldering pad and heat it with a torch. When the metal has a dull, rose-colored glow, it is annealed. Quench the metal in water, and then soak it in pickle to remove oxides.

PATINATING WITH LIVER OF SULFUR

Polish your piece before patinating. (If you tumble-polish your piece after patinating, reserve the used shot for future patinated pieces, or scrub and rinse your shot and barrel thoroughly; liver of sulfur residue can contaminate other pieces.) Oil and dirt on the piece can affect the patina, so use a degreasing soap to clean the metal before patinating.

Prepare a liver of sulfur solution according to the manufacturer's instructions. Dip your metal in the solution with tweezers for a few seconds, then rinse the metal in cool water to stop the chemical reaction. For a darker patina, continue to dip and rinse the metal. Use a brass brush with soapy water, a polishing cloth, or pumice powder to remove or modify the patina. By using different temperatures and amounts of water to make the liver of sulfur solution, you can create different colors of patina; experiment until you achieve the desired color.

If you don't want your entire piece to have a patina, dip a soft-bristle brush into the solution, and dab it onto your piece. Follow the same instructions as above until you achieve the desired color.

SWEAT SOLDERING

Apply flux to both metal pieces you want to join. Place the smaller piece on a soldering pad. Heat the piece until the flux is a white crust. Place solder pallions on the smaller metal piece, and heat it until the solder flows **[Figure 1]**. Using soldering tweezers, quickly position the smaller metal piece solder-side down on the larger piece. Heat both pieces from above and below until the solder melts again **[Figure 2]**.

A bright line of silver will appear at the edge where the two metal pieces meet, and the smaller piece may slightly drop to indicate that the solder has reflowed. Quench the piece in water.

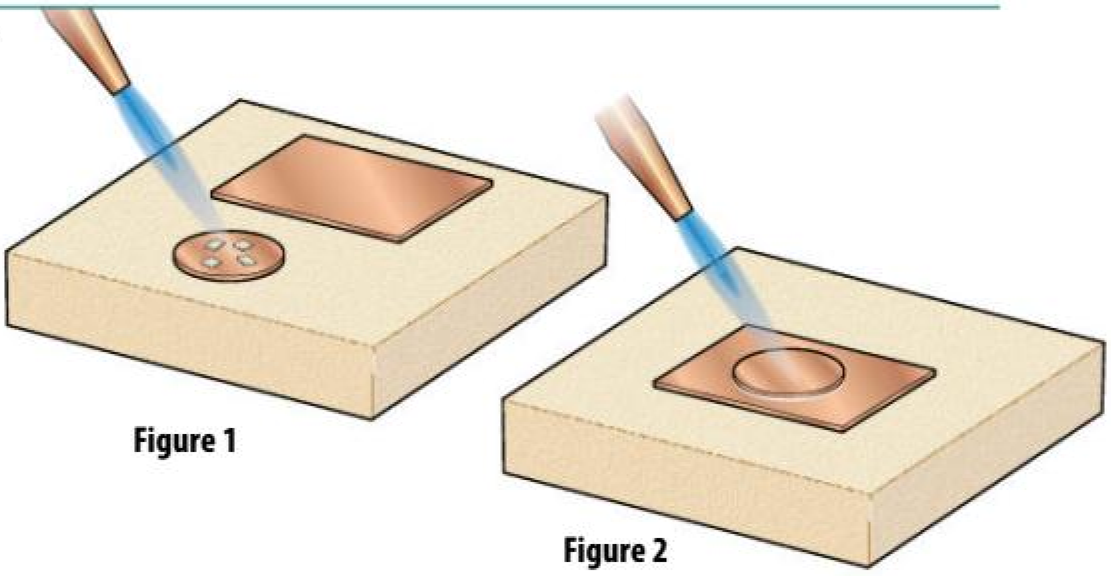


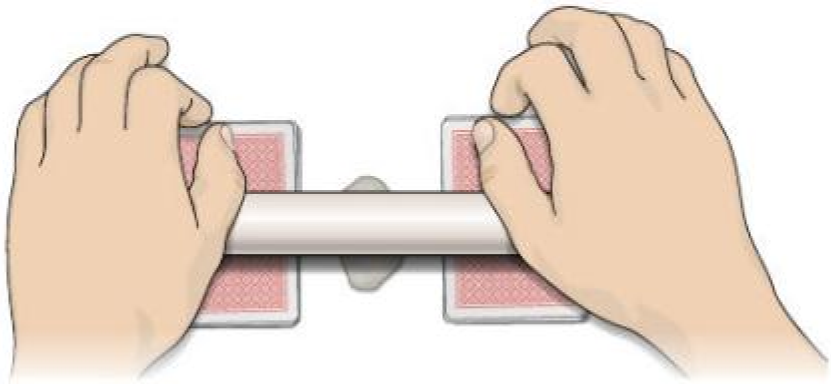
Figure 1

Figure 2

metal clay techniques

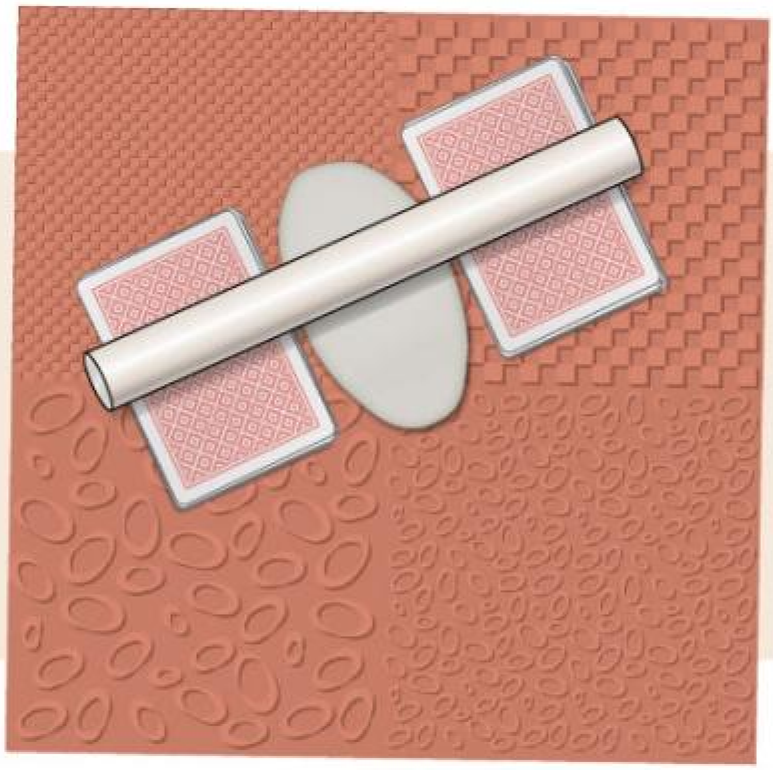
ROLLING METAL CLAY

Metal clay dries rapidly, so remove only the amount you will use during a given work session. Store unused clay in an airtight container with a small piece of moist sponge or paper towel. Cover clay with plastic wrap while you are not working with it. Use a spray bottle to remoisten the clay if it begins to dry out. Apply olive oil or natural hand balm to your hands, tools, and work surface to prevent the clay from sticking. Decide how thick you want your metal clay sheet to be. Make two stacks of either playing cards, mat board, or thickness guides that equal that thickness. Place your lump of clay on your work surface between the two even stacks. Roll the clay to a uniform thickness, using an acrylic roller or PVC tube. Rotate the clay 90° and roll it again.



TEXTURING METAL CLAY

Apply a light coat of olive oil or hand balm to the surface of a texture sheet and to a PVC tube or acrylic roller. Follow the instructions for "Rolling Metal Clay," *above*, to make a sheet of clay. Place the texture sheet texture-side up between two even stacks of playing cards or thickness guides. Lay the sheet of metal clay on the texture sheet. Using the roller, roll over the clay sheet. Carefully peel the clay from the texture sheet.



wirework techniques

MAKING JUMP RINGS

Select a wooden dowel with a diameter that matches the inside diameter of the jump rings you want to make. Drill a hole through one end of the dowel. Insert the end of the wire into the hole to anchor it to the dowel. Wrap the wire around the dowel, keeping the coils tight against one another **[Figure 1]**.

Cut the wire at the end that anchors the spring. Slide the spring to the opposite end of the dowel. Secure the dowel against the V notch in your bench pin, and use a jeweler's saw with a 2/0 blade to cut a shallow, vertical slot at the end of the dowel to guide your blade as you cut the spring.

Hold the spring and dowel in your nondominant hand. Saw through the top of the spring, feeding the spring toward the slot in the dowel **[Figure 2]**. Be careful not to cut the jump rings in half.

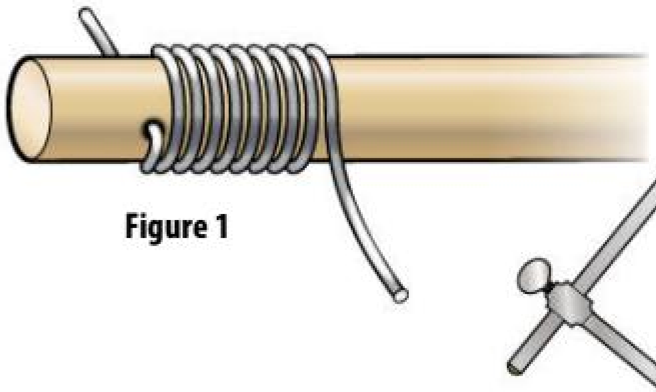


Figure 1

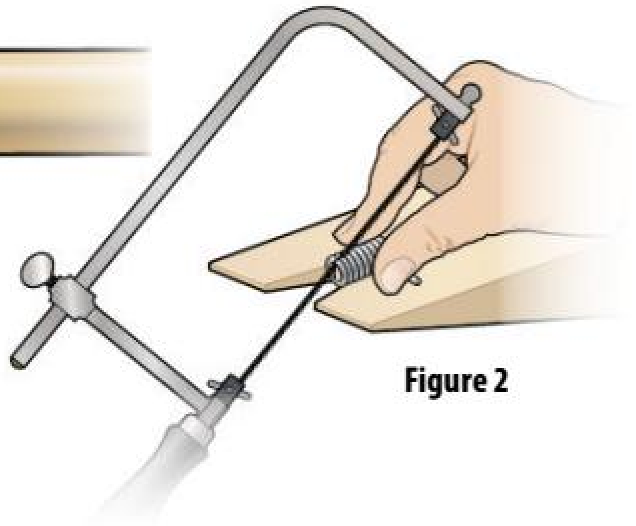
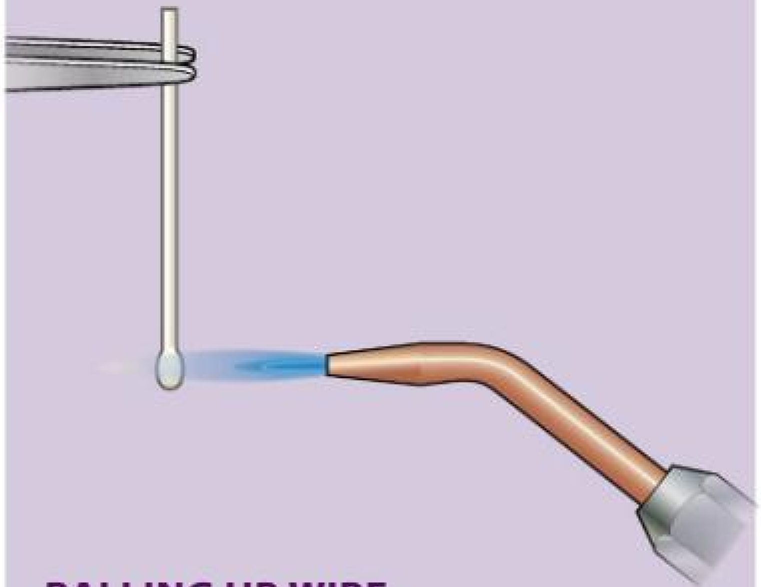


Figure 2



BALLING UP WIRE

Use cross-locking tweezers to grasp a piece of wire, and dip the wire in flux. Hold the wire vertically, and lower one end of the wire into the flame, just past the tip of the inner blue cone of your torch's flame. After a ball forms at the end of the wire, remove the flame, and then quench, pickle, rinse, and dry the wire.

toolboxes

Metal clay

- Acrylic or PVC roller
- Airtight storage container
- Brass brush
- Burnisher
- Clear, hard plastic sheet
- Craft knife
- Drinking straw
- Fine-tip paintbrush
- Flexible Teflon sheet
- Kiln, kiln shelf
- Mug warmer
- Needle files
- Needle tool
- Olive oil or natural hand balm
- Pin vise or holder, drill bits
- Plastic wrap
- Playing cards or thickness gauge
- Rubber block
- Shape cutters
- Smoothing tool
- Spatula or palette knife
- Syringe
- Texture sheets or molds
- Tissue blade: flexible, rigid, or wavy
- Tumbler, steel shot, burnishing compound
- Vermiculite, kiln-safe container
- Water: distilled
- Wet/dry sandpaper: various grits, or nail buff/ emery board

Sawing/piercing

- Adhesive bandages
- Alligator tape (optional)
- Bench pin
- Center punch: manual or automatic
- Dividers
- Files: hand or needle
- Flex shaft, drill bits
- Jeweler's saw frame, saw blades
- Lubricant or beeswax
- Rubber cement or glue stick
- Safety glasses

Soldering

- Anti-flux
- Binding wire
- Borax (for borax solution)
- Copper tongs
- Fire-resistant surface: soldering pad, firebrick, or charcoal block
- Flux, flux brush
- Pickle pot with pickle
- Solder: hard, medium, easy
- Soldering pick
- Striker: manual or automatic
- Third hand, insulated cross-locking tweezers
- Torch, various tips
- Sandpaper: various grits
- Tumbler, steel shot, burnishing compound

Wirework

- Bench block or anvil
- Cutters: side, end, or flush
- Hammers: chasing, ball peen, cross peen
- Mallet: rawhide or plastic
- Mandrels or dowels
- Needle files
- Pliers: chainnose, flatnose, roundnose, parallel, nylon jaw
- Polishing cloth
- Sandpaper: various grits
- Tumbler, steel shot, burnishing compound

See everything in these toolboxes and download a PDF at **www.artjewelrymag.com/reference.**

safety basics

All media

- Wear a dust mask while working with materials and tools that generate particulates.
- Read all Safety Data Sheets (SDSs) before using a new material, and keep a copy of the SDS for any material you use.
- Don't use tools or chemicals in ways contrary to the manufacturer's intended purpose.
- Wear protective gloves while handling caustic materials or chemicals.
- Keep a properly rated fire extinguisher and a source of clean water near your workstation.
- Keep cutting tools sharp and all tools and equipment properly maintained.

Metals

- Wear eye protection at all times while working with metals, wire, and metalsmithing tools.
- Wear a non-flammable apron to protect your clothing.
- Tie back long hair.
- Work in a well-ventilated area at all times.
- Wear closed-toe shoes.
- Do not wear clothing or jewelry that might get caught in machinery or catch fire.

Metal clay

- Use kiln in a well-ventilated area to sinter clay.
- Do not use metal clay tools for food preparation or consumption.
- Follow manufacturers' instructions for programming your kiln and sintering times and temperatures.
- Do not torch-fire metal clay pieces that have a core inclusion, such as cork or wood clay.
- Do not sinter or torch-fire metal clay pieces that are not completely dry, as they may explode. AJ

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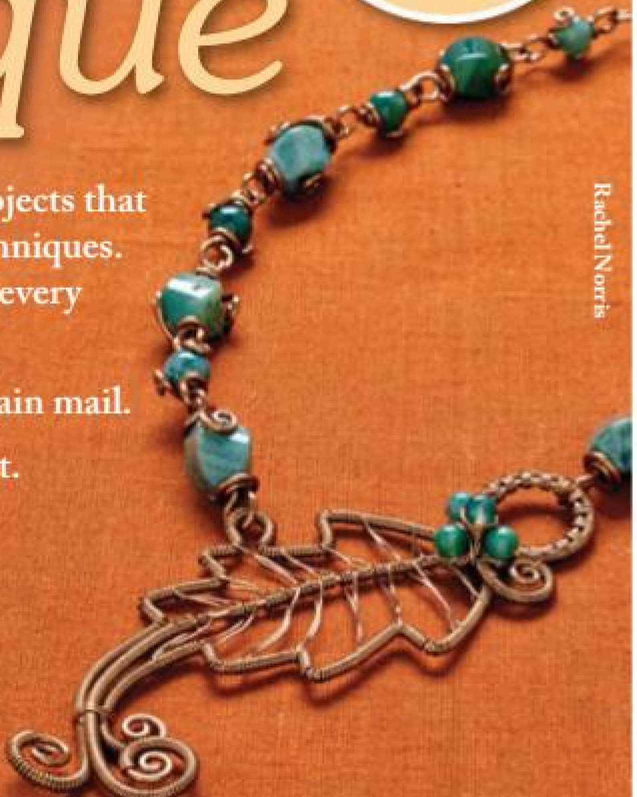

Rachel Norris

contacts

When contacting artists via email, please put "***Art Jewelry***" in the subject line.

GALLERY

page 47

- Annette Dam, www.annettedam.dk
- Abi Cochran, www.silverspirals.co.uk
- Angela B. Crispin, www.angelacrispin.com
- Spencer Dickerson, spencerdickerson@yahoo.com
- Jon M. Ryan, www.jonmryan.com
- Monique Perry, www.moniquesartjewelry.com
- Caitie Sellers, www.caitiesellers.com
- Toni Tischer, www.tischerstudios.com

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suppliers

CREATE A KINETIC CHAIN WITH UNIVERSAL JOINTS

page 30

- Metal, torch, tweezers, solder pick, flux, pickle pot, copper tongs, dividers, jeweler's saw and saw blades, sandpaper, flat file, drill and drill bit, metric ruler, center punch, pliers, ring mandrel and rawhide or plastic mallet, crosslocking tweezers, third-hand stands, miter jig, machinist's square (optional), split mandrel, metal scribe: Rio Grande, *right*
- Hammer: Harbor Freight, www.harborfreight.com

MAKE A RING THAT SWINGS

page 36

- All materials, tools, and supplies: Rio Grande, *right*

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DESIGN 3 CUSTOM PIN-TO-PENDANT CONVERTERS

page 44

- Brass tubing: K&S precision metals, *below*
- Tools: Rio Grande, *below*; Otto Frei, *below*

EARRINGS: TUBE-HOOP EARRINGS

page 52

- Silver, copper, flux, solder, drawplate, saw: Rio Grande, *below*
- Tool steel: Metal Supermarkets, www.metalsupermarkets.com
- Tools: Grobet, www.grobetusa.com

HOW TO CONSTRUCT AN INVISIBLE HINGE

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- Tools, metal: Allcraft, www.allcraftusa.com; Rio Grande, *below*; Otto Frei, *below*
- Metal: E.B. Fitler, 800.346.2497
- Silver and precious metals: Hauser & Miller, www.hauserandmiller.com; Hoover & Strong, www.hooverandstrong.com
- Silver and other metal: Metalliferous, www.metalliferous.com
- Brass tubing: K&S Precision Metals, *below*; Micromark, www.micromark.com
- Brass tubing, tools: Amazon, www.amazon.com

BUILD A COLLECTION OF METAL-CLAY CHARMS

page 62

- Metal clay: PMC Connection, www.pmcconnection.com
- Tools: Cooltools, www.cooltools.us
- Porcelain texture sheets: Mostly Stoneware, www.etsy.com/shop/mostlystoneware

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- Otto Frei: 800.772.3456, www.ottofrei.com
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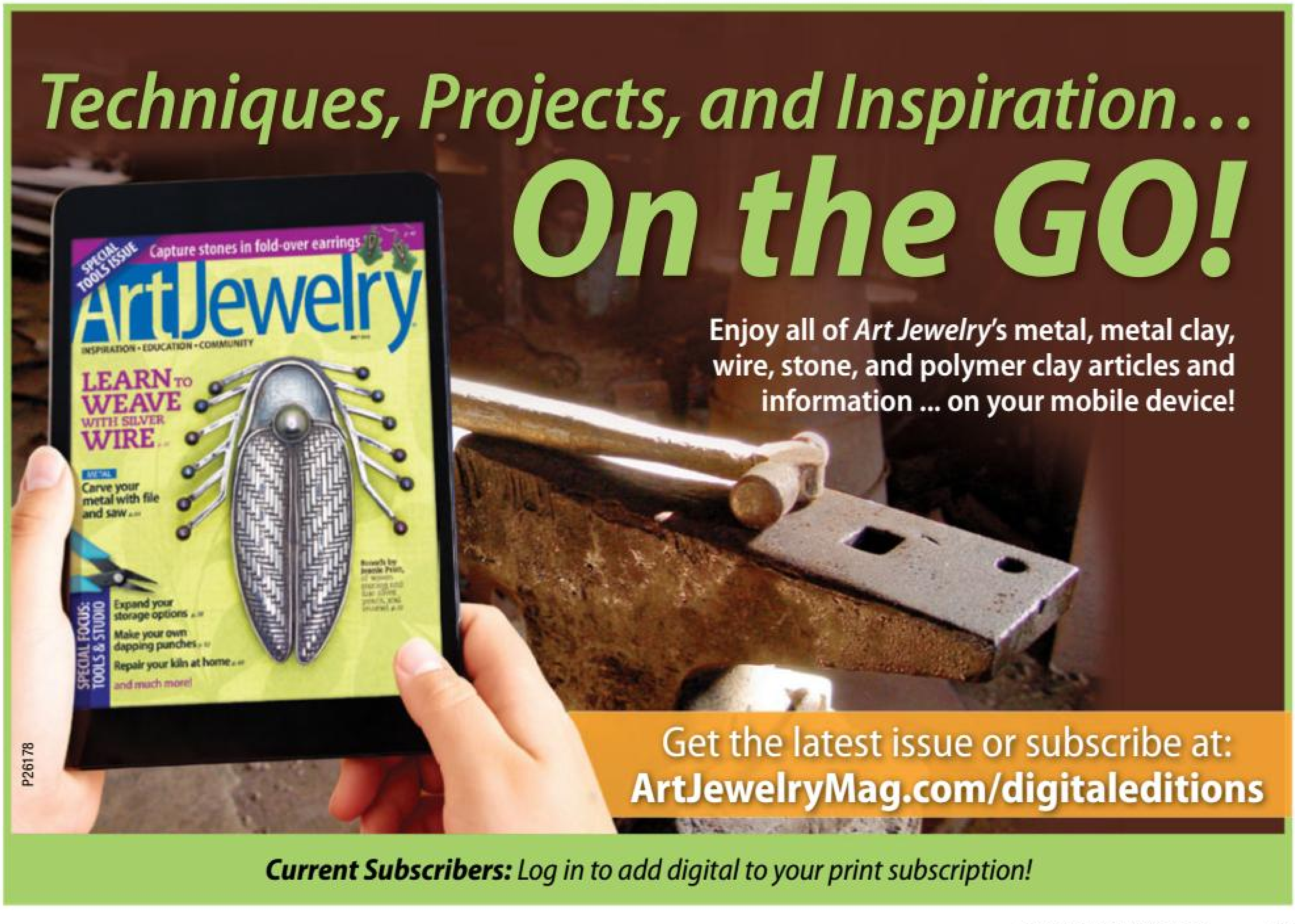

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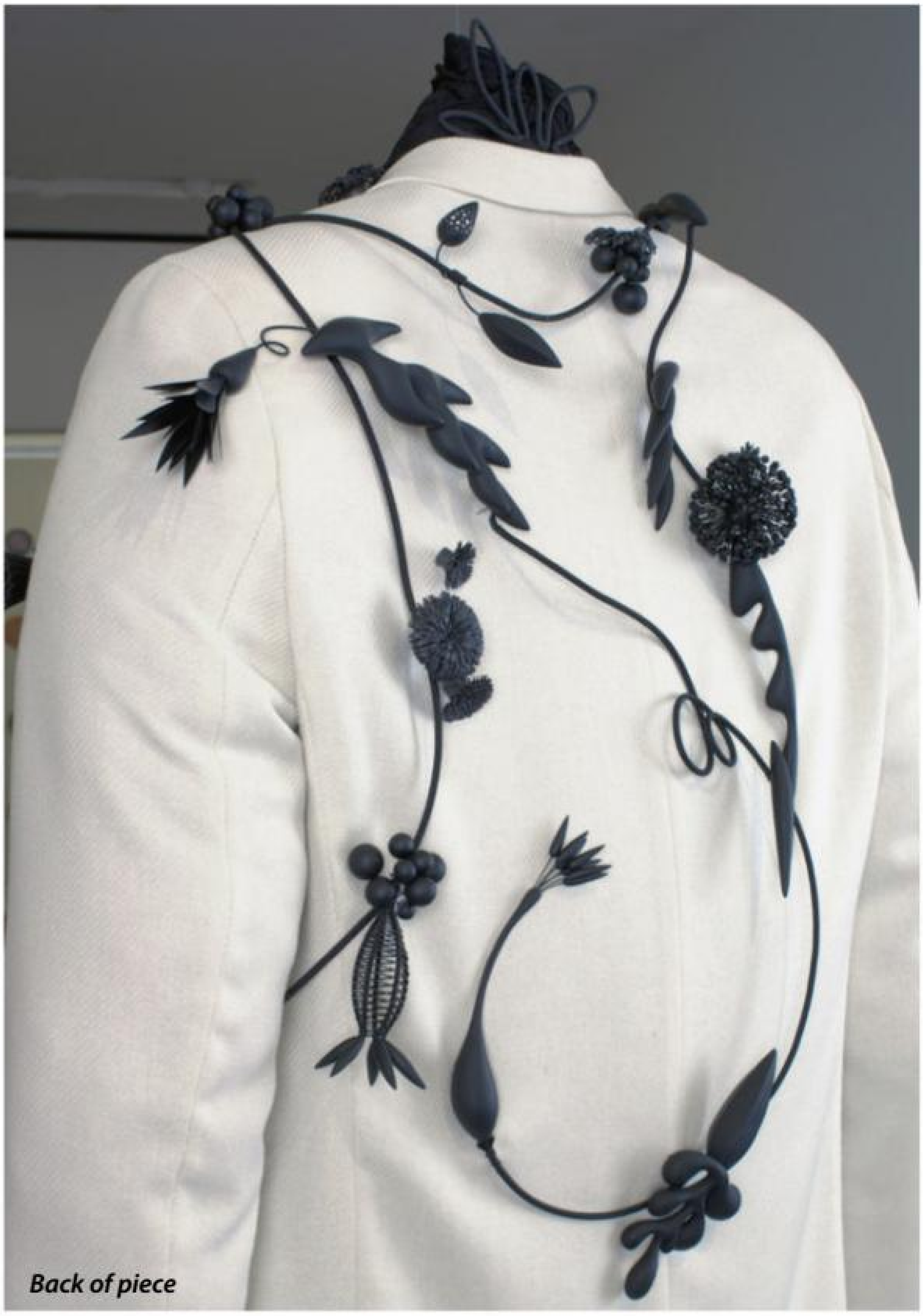

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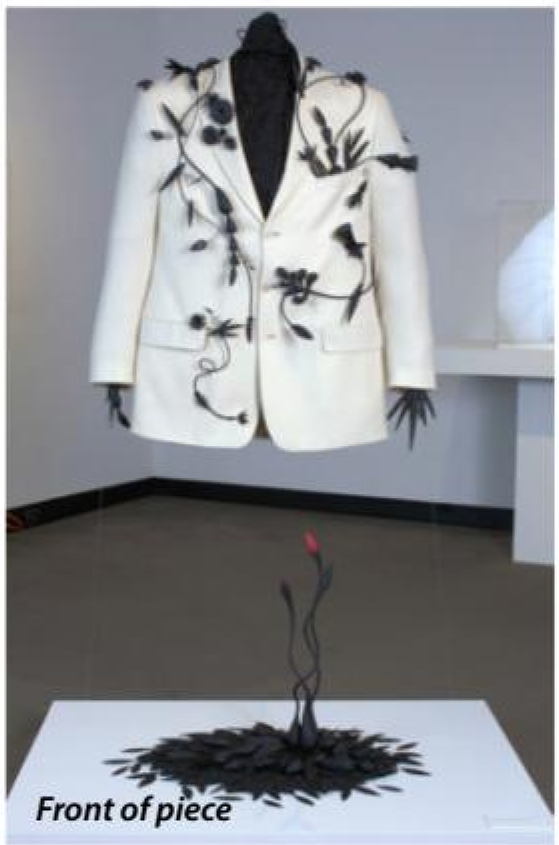

Front of piece

Dynamic Tension

Jeffrey Lloyd Dever's mixed-media installation, *Whence From a Darkling Heart*, is a metaphorical exploration of the idea that good and evil, light and dark, and the pure and perverse are in constant struggle. It is a reminder that, without a mindful eye, even the pure and beautiful can be deceived, enveloped, and suffocated. The exploration of found and reimagined materials — including felt, bicycle tubes, and paper clips — is key for Dever. (And, of course, he incorporates his signature polymer-clay hollow forms and reinforced armature techniques.)

By limiting his color palette to white and black (and a single burst of red), Dever references the title of the piece, which implies that the wearer is steadily being consumed by darkness. By integrating the reverse side as part of the whole, Dever suggests that the climbing vines aren't just waging a frontal assault: the entire body is being entangled. As a glimmer of hope, a single bud emerges from the fallen leaves below. What do you see: the beauty or the horror? —*Annie Pennington* AJ

AT A GLANCE

Title: *Whence From a Darkling Heart*
Artist: Jeffrey Lloyd Dever
Info: Reclaimed sport coat, polymer clay, repurposed wire, felt, cord casing, industrial mat, paper clips, bicycle tubes, pins, etc.; 66 x 27 x 20 in. (167.6 x 68.6 x 50.8 cm)
Contact: www.jeffreylloyddever.com

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